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Evaluation of Lac Yield Uder Different Host Tree at Mahasamund District of Chhattisgarh

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Abstract
The current investigation on, "Evaluation of Lac Yield Uder Different Host Tree at Mahasamund District of Chhattisgarh" was laid out during 2023–2024 in the village Kurrubhata at Mahasamund District of Chhattisgarh. In the study area the sampling method used was simple random sampling, with four treatments T_1 (*Ziziphus mauritiana*), T_2 (*Flemingia semialata*), T_3 (*Calliandra calothyrsus*) *and* T_4 (*Schleichera oleosa*) with five replications. Five years old *Z. mauritiana, Flemingia semialata, Calliandra calothyrsus and Schleichera oleosa* trees were selected and three tertiary shoots or branches (2 months old) were taken for inoculation. For Aghani crop, brood lac stick (10 -15 cm) was inoculated on each tertiary shoot in the month of July, for Jethawi crop, brood lac sticks were inoculated in the month of January were monitored till the emergence of crawlers. After the emergence of crawlers, the observations on various biological and productivity linked parameters were recorded till the harvesting of the crop in the month of December. The *Schleichera oleosa* shows highest stick lac yield (56.84 Kg/plant), height of the host tree (14.26 m), DBH of the host tree (70.52 cm), weight of scraped lac per 30 (cm) stick lac (20.13 g/ 30 (cm) stick lac), Yield of lac per hectare was obtained (kg) (14927.88 kg/ha) in Jethawi season (Summer) and maximum length of stick lac was seen in *Ziziphus mauritiana* (76.09 cm/plan), maximum weight of 30 (cm) stick lac obtained from *Schleichera oleosa* (57.10 g/30 cm) in Aghani season (Winter). In Mahasamund district the best host tree species to be recommended *Schleichera oleosa* followed by *Ziziphus mauritiana*, *Calliandra calothyrsus* and *Flemingia semialata* for higher yield of lac production.

Keywords: Aghani, Jethwi, Production, stick lac, Scraped lac

Introduction
Forest are the rich sources of the NTFP's (Non-Timber Forest Products) which gives direct or indirect income and livelihood option for the tribal peoples who lives around the forest. Lac is one of the valuable NTFP, which improve the livelihood of local people.

Lac insect scientifically *Kerria lacca K.* belongs to order Hemiptera and family Coccidae. Lac is Nature's gift to mankind and the only known commercial resin of animal origin. Lac is a natural resin secreted by the insect *Kerria lacca (Kerr.)* which thrives on the tender twigs of specific host trees. The most common host trees for commercial lac cultivation are *Butea monosperma* (Palas), *Ziziphus mauritiana* (Ber) and *Schleichera oleosa* (Kusum), besides several other trees of regional importance. They are natural, renewable, non-toxic and eco-friendly products i.e. resin, dye and wax are derived from the lac. Lac is mainly cultivated in India, Myanmar, Thailand, parts of China, Taiwan, Indonesia, Philip- pines, Vietnam, Cambodia. India is the leader in production and export of lac in the world. Lac cultivation is an important source of income supporting livelihood for the forest and sub-forest dwellers. It has also high potential for generating employment for both men and women in forest and sub-forest areas of the country.

India is the world leading in production of lac quality. In India lac is mainly produced by two strains of lac insect, (*Kerria lacca Kerr*). These are "rangeeni" lac is mainly produced on trees of *Butea monosperma*, the flame of forest and *Ziziphus mauritiana*, the Indian plum tree and kusumi" lac is mainly produced *Schleichera oleosa*, the lac tree and to some extent on plum tree also. The Rangeeni lac has summer and rainy season crop, commonly called baisakhi and katki, each of 8-and 4-months duration respectively. The kusumi lac has also two crops, the summer and winter commonly called jethwi and aghani, each of around six months duration.

The production of commercial summer crop of rangeeni lac largely depend on preceding rainy season crop as the rainy season crop act as a broodlac for commercial summer crop, raised in October- November. Similarly, production of "kusumi" winter crop (aghani) which is main commercial crop largely depends on preceding summer season crop which act as a broodlac.

Out of 25 crore households in India about one million farm families are engaged in lac cultivation across the country. According Tribal Cooperative Marketing Development Federation of India Limited (TRIFED), there is 6.66 lakh registered gatherers of NTFPs in India.

The production of raw lac in India is approximately 20,000 metric tonnes per year. Lac culture has been a good source of foreign revenue. The major lac producing states in India are Jharkhand- 57%, Chhattisgarh- 23% and West Bengal- 12%. Other minor producers include Odisha, Maharashtra, Assam, Andhra Pradesh and Uttar Pradesh. Other states like Odisha, Madhya Pradesh, Punjab, Rajasthan etc. have shown increased production of lac. Approximately three million tribals inhabiting in these areas have taken up lac cultivation. (Sharma *et al*. 2006) [6].

Lac production in a lac growing districts of Chhattisgarh has been assessed with parameters like minimum, maximum, average production and Simple Growth Rate. The analysis of data shows that Korba district recorded highest production i.e. 29.5% of total production of the state followed by Kanker (18.7%). Rajnandgaon (15.1%) and others. Only two districts namely Korba and Raipur recorded positive growth to the extent of 9.6 and 4.3% per annum. Highest negative growth rate was recorded in Durg (-52.3%) and Sarguja (-50.2%) districts but their contribution in state production is low. Kanker and Rajnandgaon, the two productive districts producing more than 1000 tons per annum recorded negative growth of 26.1 and 31.8% per annum. For the state as whole, highest negative growth was recorded for rainy season crop of rangeeni 37.7% followed by kusumi-summer (17.5%), kusumi-winter (- 14.3%) and rangeeni-summer crop (-5.7%) (Jaiswal *et al*. 2011) [1].

Materials and Methods

The experiment entitled Evaluation of Lac Yield Uder Different Host Tree at Mahasamund District of Chhattisgarh have been carried out during 2023- 2024 in village Khuteri and Kurrubhata at Mahasamund District of Chhattisgarh.

Simple Random Sampling was employed with four (4) treatments and five (5) replication each. The treatment details are: T_1 (*Ziziphus mauritiana*), T_2 (*Flemingia semialata*), T_3 (*Calliandra calothyrsus*) *and* T_4 **(***Schleichera oleosa*). Five years old *Z. mauritiana, Calliandra calothyrsus and Schleichera oleosa* trees were selected and three tertiary shoots or branches (2 months old) were taken for inoculation. For Aghani crop, brood lac stick (10 -15 cm) was inoculated on each tertiary shoot in the month of July, for Jethawi crop, brood lac sticks were inoculated in the month of January were monitored till the emergence of crawlers. After the emergence of crawlers, the observations on various biological and productivity linked parameters were recorded till the harvesting of the crop in the month of December.

Selection of suitable host plants for lac cultivation is of paramount importance because quality and yield of lac depend on the quality of tree then inoculation of brood lac on host trees in (Aghani season) June-July 2023 and (Jethawi season) January-February 2024.

Results and Discussion

The present investigation entitled was conducted to know the Evaluation of Lac Yield Uder Different Host Tree at Mahasamund District of Chhattisgarh. The results obtained in the present investigation are encompassed under appropriate headings with tables and figures.

Height of host tree (m): Tree height was significantly maximum in *Schleichera oleosa* (14.26m) followed by *Ziziphus mauritiana* (4.56 m), *Calliandra calothyrsus* (1.55 m) and minimum was recorded in *Flemingia semialata* (1.11 m).

Mishra *et. al* (2016) [4] reported that *Schleichera oleosa* is the deciduous tree, up to 40 m tall followed by *Ziziphus mauritiana* is a spiny, evergreen shrub or small tree up to 15 m high, *Flemingia semialata* is little less woody and deep-rooted shrub up to 2.0 m in height.

DBH of host tree (cm): According to the study's DBH was significantly maximum in *Schleichera oleosa* (70.52 cm) followed by *Ziziphus mauritiana* (10.17 cm), *Calliandra calothyrsus* (5.84 cm) and minimum was recorded in *Flemingia semialata* (2.49 cm).

Mishra *et. al* (2016) [4] reported that *Schleichera oleosa* Bole occasionally up to 2 m in diameter followed by *Ziziphus mauritiana* trunk 40 cm or more in diameter and *Flemingia semialata* stem 2 cm or more in diameter.

Length of stick lac (cm): In present investigation for the measurement of length of stick lac, 10 stick lac from each tree were taken and average was calculated and represented in table (Table 4.3). Length of stick lac (cm) was significantly maximum in *Ziziphus mauritiana* (76.09 cm) followed by *Flemingia semialata* (67.77 cm), *Calliandra calothyrsus* (64.88 cm) and minimum was recorded in *Schleichera oleosa* (63.97 cm).

Meshram (2018) [3] evaluated that the mean length of lac stick per tree was 88. 42 cm in ber followed by semialata, palas, and kusum with 61.34,53.92 and 52.14 cm lac stick per host plant in rangeeni and kusmi strain respectively. These findings are similar to the present studies, the length of stick lac depended on the availability of succulent branches of host plant and quality of food for good settlement of lac insect larvae. Janghel (2013) [10] reported that the length of lac sticks per tree in rangeeni strain varied from 75 to 153 cm in palas host tree, which were higher than the present finding. While Sahu (2016) [11] reported mean length of lac stick 68.66 to 77.56 cm in palas which was similar to the present findings. The length of lac stick depended on the settlement of lac insect larvae on succulent branches of host plant and the quality of food.

Weight of 30 cm stick lac (g): Weight of 30 cm stick lac (g) was significantly maximum in *Schleichera oleosa* (57.10 g/30 cm stick lac) followed by *Ziziphus mauritiana* (56.54 g/30 cm stick lac), *Calliandra calothyrsus* (52.32 g/30 cm stick lac) and minimum was recorded in *Flemingia semialata* (42.83 g/30 cm stick lac).

Meshram (2018) [3] reported that fresh mean weight of lac stick per 30 cm stick varied from 33.96 to 47.68 g per 30 cm stick. The Mean weight of lac stick was highest on kusum with 47.68 g followed by ber, semialata and palas with 44.21, 42.20 and 33.96 g per 30 cm stick in both the strain these finding is similar to present studies. Patelet *et al.* (2014) [5] reported that mean weight of 30 cm lac stick varied from 24.26 to 80.59g in case of kusmi strain and 21.86 to 76.00 g in case of rangeeni strain in *Z.*

mauritiana host plant. Namdev (2014) [9] reported that mean weight of lac stickper 30 cm varied from 16.88 to 92.03g in kusmistrain on *Z. mauritiana*.

Weight of scraped lac per 30 cm stick lac (g): Weight of scraped lac per 30 cm stick lac (g) was significantly maximum in *Schleichera oleosa* (20.13 g/30 cm stick lac) followed by *Ziziphus mauritiana* (18.96 g/30 cm stick lac), *Flemingia semialata* (17.82 g/30 cm stick lac) and minimum was recorded in *Calliandra calothyrsus* (17.28 g/30 cm stick lac).
Meshram (2018) [3] also reported the mean fresh weight of scraped lac from 30 cm length stick varied from 16.06 to 23.96 g. The mean fresh weight of scraped lac was highest on Kusum with 23.96 g fallowed by Ber, Semialata and Palas with 22.49, 20.51 and 16.06 g in both the strains respectively. Patelet *et al.* (2014) [5] reported that mean weight of raw lac per 30 lac stick varied from 12.43 to 48.04 g in kusmi and 7.54 to 22.37 g in rangeeni strain, more raw lac was found in kusmi than in rangeeni. The mean weight of scraped lac was higher in kusmi and lower in rangeeni

Weight of stick lac per plant (kg): Weight of stick lac per plant (kg) was significantly maximum in *Schleichera oleosa* (56.84 kg/ plant) followed by *Ziziphus mauritiana* (5.55 kg/ plant), *Calliandra calothyrsus* (3.81 kg/ plant) and minimum was recorded in *Flemingia semialata* (0.43 kg/ plant).
Patel *et al.* (2014) [5] reported that the yield of lac per plant recorded 4.00 to 5.70 kg kusmi strain and 3.20 to 4.55 kg in rangeeni strain on ber host plant. Meshram (2018) [3] reported that mean yield of stick lac per plant varied from 0.305 to 54.94 kg per plant. The yield of raw lac per plant was maximum in Kusum with 54.94 kg per plant followed by semialata 0.305 kg in kusmi strain and Ber with 5.32 kg per plant followed by Palas 3.72 kg in rangeeni strain. Further, Sharma and Ramani (2010) [8] also reported average yield of stick lac on palas (1.2-2.8 kg) onrangeeni and kusum (10-100 kg) and ber (3-12 kg) in kusmi.

Yield of lac per hectare (kg): Yield of lac per hectare (kg) was significantly maximum in *Schleichera oleosa* (15801.52 kg/ha) followed by *Ziziphus mauritiana* (3085.8 kg/ha), *Flemingia semialata* (4300 kg/ha) and minimum was recorded in *Calliandra calothyrsus* (2118.36 kg/ha).
Patel *et al.* (2014) [5] reported that the yield of stick lac per plant was recorded 4.00 to 5.70 kg in kusmi strain and 3.20 to 4.55 kg in rangeeni strain on ber host plant. The yield per hectare of kusmi strain was recorded more than the rangeeni strain further. Singh *et al.* (2015) [7] reported 120 kg brood lac yield recorded from 400 semialata host plant in kusmi strain**.** Meshram (2018) [3] reported that the yield of raw stick lac per hectare varied from 30.00 to 152.18 Q./ha. The yield of raw stick lac was obtained on kusum (152.18) Q./ha followed by 30.00 Q./ha in kusmi strain and palas with 14.88 Q./ha and ber with 14.73 Q./ha in rangeeni strain, the pooled mean of both years yield per hectare was recorded maximum in kusmi strain than in rangeeni strain.

Table 1: Observation on Height of host tree, DBH of host tree, Length of stick lac, Weight of 30 cm stick lac, Weight of scraped lac per 30 cm stick lac, and Weight of stick lac per plant.

Treatments	Height of host tree(m)	DBH of host tree (cm)	Length of stick lac (cm)	Weight of 30 cm stick lac (g)	Weight of scraped lac per 30 cm stick lac (g)	Weight of stick lac per plant (kg)
T_1 *Ziziphus mauritiana*	4.56	10.17	76.09	56.54	18.96	5.55
T_2 *Flemingia semialata*	1.11	2.49	67.77	42.83	17.82	0.43
T_3 *Calliandra calothyrsus*	1.55	5.84	64.88	52.32	17.28	3.81
T_4 *Schleichera oleosa*	14.26	70.52	63.97	57.10	20.13	56.84
S.E(m) ±	0.121	0.948	1.138	0.757	0.165	0.533
CD@0.05%	0.376	2.95	3.545	2.359	0.514	1.660
C.V. (%)	5.005	9.334	3.723	3.232	1.986	7.130

Table 2: Observation on Yield of lac per hectare

Treatments	Aghani	Jethawi	Total yield (kg)/ha
T_1 *Ziziphus mauritiana*	3085.8	-	3085.8
T_2 *Flemingia semialata*	4300	-	4300
T_3 *Calliandra calothyrsus*	2118.36	-	2118.36
T_4 *Schleichera oleosa*	-	15801.52	15801.52

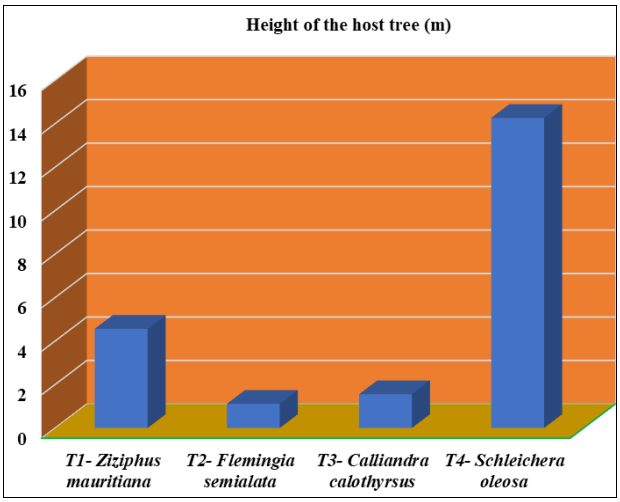

Fig 1: Height of the host tree

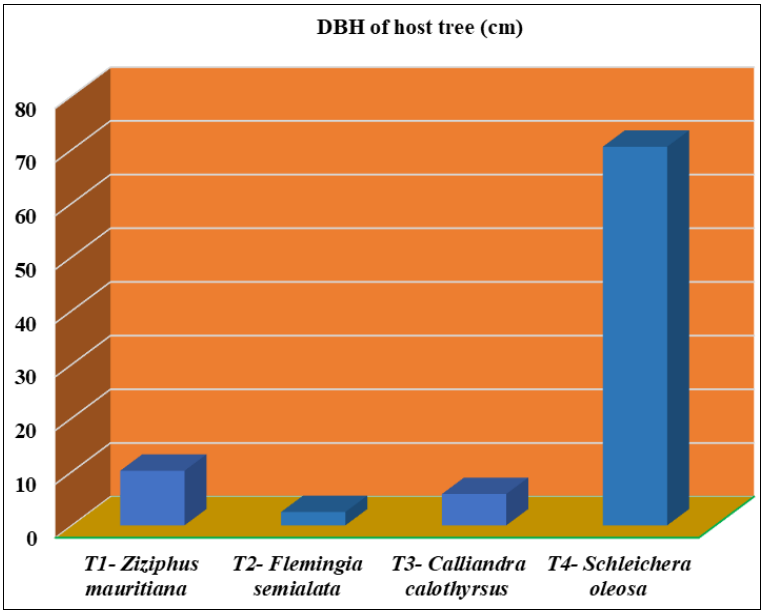

Fig 2: DBH of the host tree

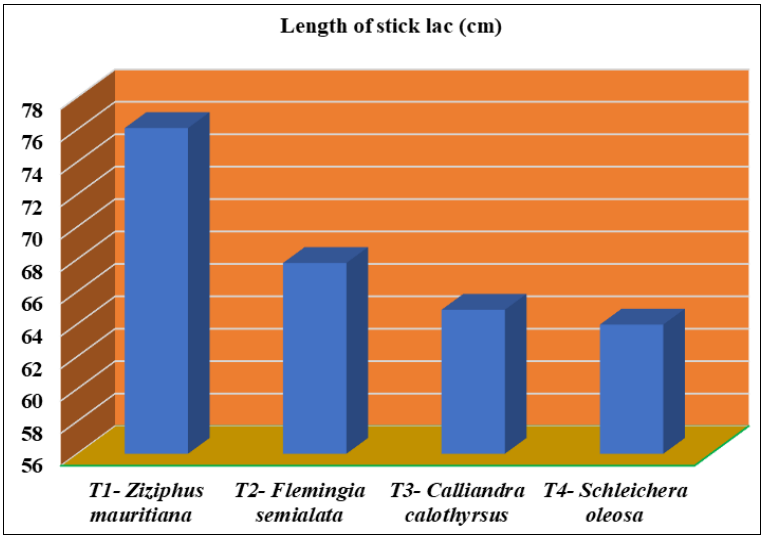

Fig 3: Length of stick lac (cm)

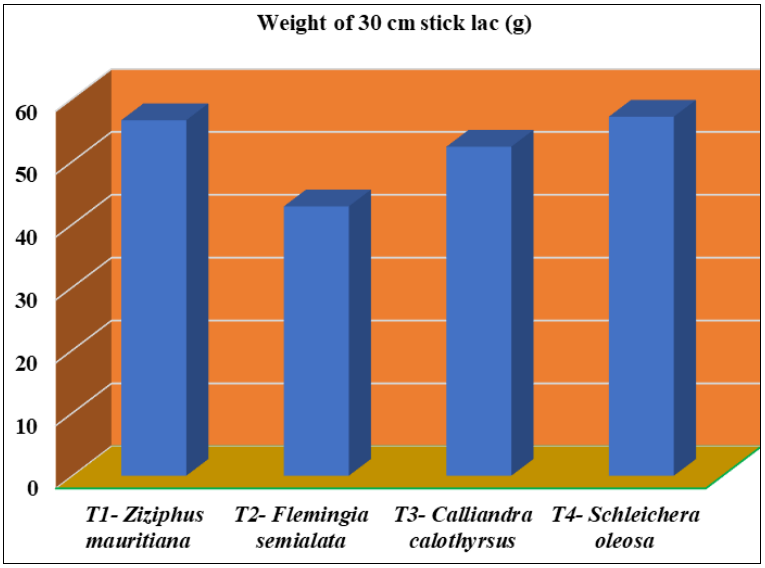

Fig 4: Weight of 30 cm stick lac (g)

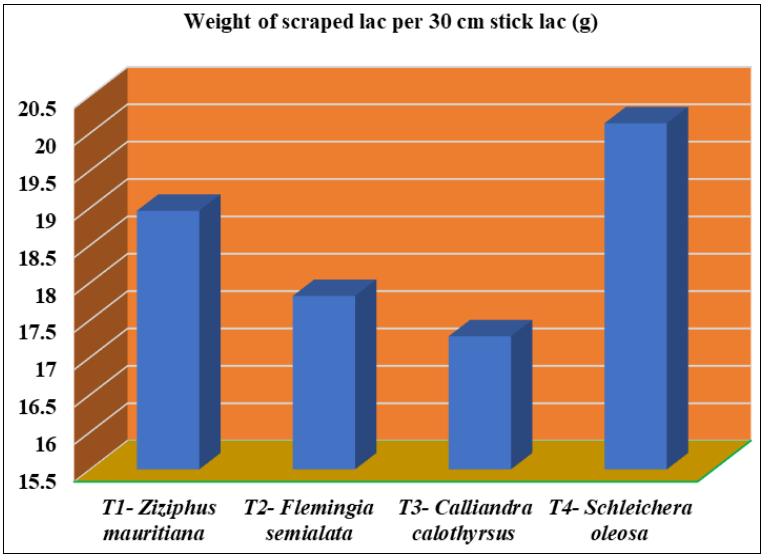

Fig 5: Weight of scraped lac per 30 cm stick lac (g)

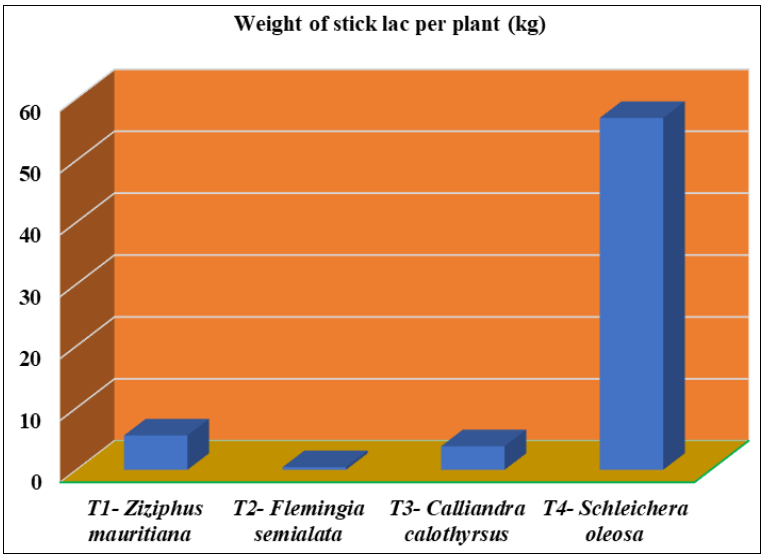

Fig 6: Weight of stick lac per plant (kg)

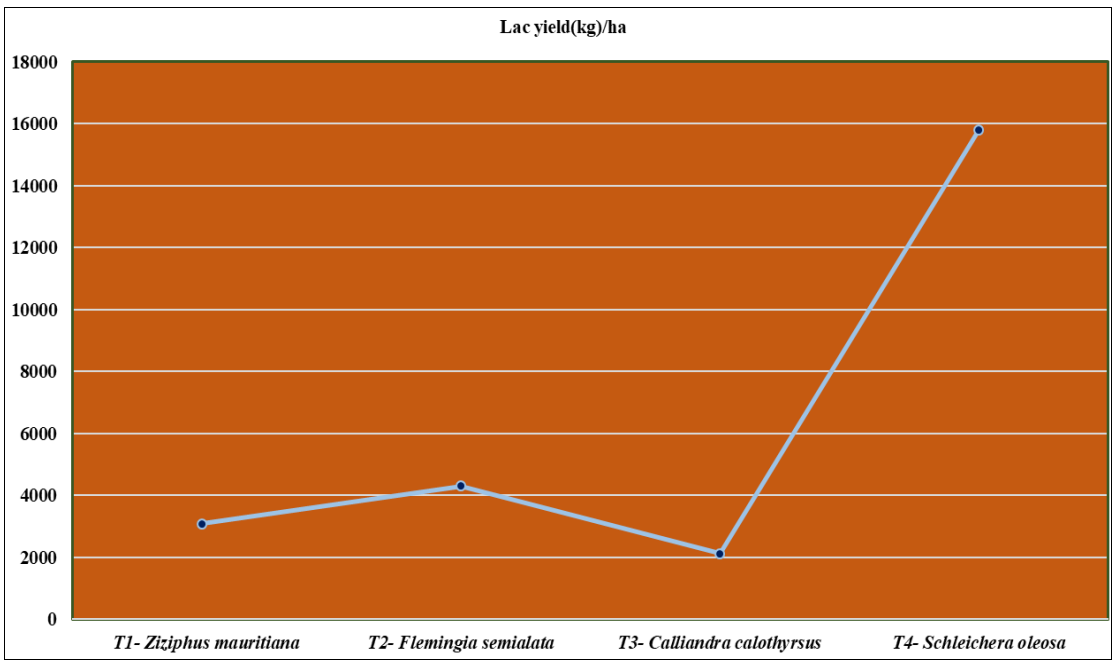

Fig 7: Yield of lac per hectare (kg)

Calliandra calothyrsus

Ziziphus mauritiana

Flemingia semialata

Schleichera oleosa

Yield of stick lac

Brood lac inoculation on host tree

Conclusion

The goal of the current study was to know that which has tree species is most suitable for higher lac production. The maximum Yield of lac per hectare (kg) was in *Schleichera oleosa* (15801.52 kg/ha) followed by *Ziziphus mauritiana* (3085.8 kg/ha), *Flemingia semialata* (4300 kg/ha) and minimum was recorded in *Calliandra calothyrsus* (2118.36 kg/ha).

In Mahasamund district the best host tree species to be recommended *Schleichera oleosa* followed by *Ziziphus mauritiana*, *Calliandra calothyrsus and Flemingia semialata* for higher yield of lac production.

Lac produce extra income to farmer and enhance his livelihood. If the farmer used the space between host tree species than the intercropped crop Agroforestry system will also give extra

income to farmer.

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Conflict of Interest
None.

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