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SHORT COMMUNICATION **OPEN ACCESS**

Calliandra surinamensis Benth. -A Promising host for lac insect, *Kerria lacca* (Kerr) in eastern Uttar Pradesh, India

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ABSTRACT
Successful lac cultivation depends on efficient and proper use of lac host plants. Lac insects can survive on more than 400 plant species but only about two dozen host plants are utilized for lac production because commercial lac cultivation has not been found economically viable on many plants and systematic lac cultivation has not been attempted on several hosts species in regions not traditionally lac strongholds. The revenue generation opportunities may be enhanced through expansion of lac culture with efficient utilization of available host plants all over the country. With the view investigation was carried out to record natural infestation of lac insect on Calliandra surinamensis and its use as source of brood lac for inoculation on other lac host species in Prayagraj district of eastern Uttar Pradesh, India. The findings reveal that C. surinamensis holds promise for large scale lac cultivation in eastern UP as it supports substantial populations of lac insect in great density indicative of excellent establishment and survival. The study recommends integration of lac culture with agriculture including C. surinamensis diversifying the land use for optimizing productivity.
Keywords: *Artificial inoculation; Brood lac; Natural infestation; Survivability; Commercial exploitation.*

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INTRODUCTION

Lac, the scarlet resinous secretion of insect, *Kerria lacca* (Kerr) [Family- Lacciferidae (Kerriidae)], cultivated from ages in India is one of the most valued non-timber forest produce being natural, biodegradable, non-toxic, odourless, tasteless, hard resin and non-injurious to health [7]. It is an export oriented product and cultivated as subsidiary occupation to agriculture resulting in additional benefit to cultivator. There is heavy demand of lac at least in 170 countries of the world. India is the largest producer of lac in the World and about 70% of the national lac production is exported [17]. Lac cultivation has high potential for employment generation for both men and women particularly in the off-agricultural season. In the forests, sub forest area and in the farm lands having host trees, lac acts as an important source of cash flow to the marginal, small and large farmers with low investment. The enterprise provides high economic returns to the farmers while its exports fetch substantial foreign exchange to the country.

Successful lac cultivation depends on efficient and proper use of lac host plants. Lac insects can survive on more than 400 plant species generally growing naturally in the forests as reported by various workers [15, 16, 11, 12, 13, 4]. The climate and presence of wide variety of lac host plants favour lac cultivation in India as evident in record of around hundred plants species on which lac insets grow for large scale lac production. However, only about two dozen host plants are utilized for lac production because as commercial lac cultivation has not been found economically not viable on many plants and systematic lac cultivation has not been attempted on several hosts species in regions not traditionally lac strongholds. Thus, about 90 % lac is produced on the three conventional lac host trees i.e. Ber (*Ziziphus mauritiana*), Palash (*Butea monosperma*) and Kusum (*Schleichera oleosa*).

Lac cultivation can be easily expanded throughout the country with proper initiatives. Since only 25 % of host population is used at national level, the revenue generation opportunities are bright with efficient utilization of available host plants all over the country. With the view present preliminary investigation

was carried out to record natural infestation lac insect on *Calliandra surinamensis* Benth. and its use as source of broodlac for inoculation on other lac host species in Prayagraj district of eastern Uttar Pradesh, India.

MATERIAL AND METHODS

Survey was made in the month of July 2020 in Prayagraj district to for presence infestation by lac insect on the branches of *Callindra surinamensis and C. haematocephala* in various parts of Prayagraj district where they have been planted in botanical gardens mainly as ornamentals. Where infestation was found percentage of infested trees, intensity of infestation (mild-*, moderate-** and profound-***) and presence of signs of previous years infestation were recorded.

Brood sticks or seed twigs (the encrustation on a branch, if on squeezing is seen to exude red liquid indicating that living eggs are present within the encrustation that can be used for inoculation as seed) removed from *C. surinamensis* were cut in length of 20-30 m and tied in longitudinal fashion to fresh succulent twigs of the host plant in such a way that each brood twig gets touched at several places through which migration of nymphs from brood twig to host twig can take place.

This artificial inoculation was carried out on 3 branches each of 3 trees of *Acacia catechu, A. nilotica, Ficus benghalensis, F. carica, F. religeosa, Prosopis cineraria*, *P. juliflora* and *Zizyphus mauritiana.* After 10 days of inoculation the symptoms of establishment of lac insect were recorded as percentage of twigs where lac insect established.

RESULTS AND DISCUSSION

Natural infestation of lac insect, *Kerrialacca* (Kerr) was observed all surveyed trees of *C. surinamensis* and 20% of those of *C. haematocephala*. However, the parameters recorded on the infested species varied to great extent as presented in the Table 1. In *C. surinamensis* the intensity of infestation of *K. lacca* was profound and suggestive of build of population over few generation while in *C. haematocephala* infestation was mild. Overall the infestation has been persisting from previous years as evident in presence of signs of insect in previous year on the branches of *C. surinamensis*.

Table 1. Details of lac insect infestation on various tree species

S. No.	Species	Infested trees (%)	Intensity of infestation	Signs of previous year/infestation
1	*Calliandra surinamensis*	100	***	Present
2	*C. haematocephala*	20	*	Absent

Fig. 1. Profound lac infestation on *Calliandra surinamensis*

Artificial inoculation of lac through brood lac of *C. surinamensis* was successful in all the species except *Acacia catechu* with varying degrees. It was quick and prominent on *Ficus benghalensis, F. religeosa,* and *Zizyphus mauritiana* with > 80% while 40-60% in case of *A. nilotica, F. carica* and *Prosopis cineraria.* Establishment was low (>30%) in other species. However, the successful artificial inoculation confirms value of *C. surinamensis* as lac host plant for brood lac production also.

Till late 1950s cultivation of lac was widespread almost all over the country. However, the area under lac cultivation has shrunken considerably with certain pockets of Jharkhand, Chhattisgarh, West Bengal, Odisha, Maharashtra, Madhya Pradesh and Gujarat accounting for virtually all lac production in India. The situation warrants revival of lac cultivation where lac was earlier cultivated and expansion to new areas. Uttar Pradesh is still a minor lac cultivating area especially Sonebhadra (Doodhi Tehsil) and Prayagraj (Meja and Koraon Tehsils) where lac is produced on *A. nilotica, Butea monosperma, Zizhyphus mauritiana* and *Z. xuylocarpa.*

Calliandra surinamensis Benth. (Family: Leguminosae, Sub-family Mimosoideae) commonly called as pink powder-puff is perennial low branching shrub and ornamental species widely distributed in tropical and sub-tropical region of Asia, Africa, Australia and America [8]. It is hardy plant preferring well-drained soil, acidic to slightly alkaline and can grow up to 15 feet in tropical condition [9]. Present investigation suggest that *C. surinamensis* holds promise for large scale lac cultivation in eastern UP as it supports substantial populations of lac insect in great density indicative of excellent establishment and survival. The species is hardy, draught tolerant, adaptable to wide range of well drained soils, having ease of propagation through seeds as well as shoot cuttings, responsive to pruning and resistant to pests and diseases [2]. Its bushy nature makes it amenable to easy execution of cultivation operations [9].

Lac culture should be integrated with agriculture including multipurpose lac host trees diversifying the land use for optimizing productivity. *C. surinamensis* makes a strong case in its favour for the purpose in view of excellent colonization of lac insect and source of brood lac for multiplication on other hosts. Two other common species of the genus, introduced in India i.e., *C. calothyrsus* Miesn.and *C. haematocephala* Hassak. have also been reported earlier as lac hosts [9, 14]. Kusmibroodlac inoculated on *C. calothyrsus* gave a brood lac ratio of 12.61 during winter season (Aghani, 2018-19) crop at farmers' field in Lodhma, Ranchi showing its potential as a good lac host [3]. All these species with fast growth rate, root system avoiding competition to agricultural crops and nitrogen fixing ability have immense potential of incorporation into agroforestry systems in the country with lac cultivation as a component for enhancing livelihood of the farmers. In fact *C. calothyrsus* has been widely utilized as agroforestry crop in other countries and trials have also been conducted in some parts of India [5, 1, 6].Thus, these species, especially *C. surinamensis* must be investigated systematically as potential lac hosts in eastern UP.

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