STUDIES ON THE BIOLOGY AND EMBRYONIC DEVELOPMENT OF SCALE, *KERRIA LACCA* (HEMIPTERA: KERRIDAE) ON BUSHY HOSTS

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ABSTRACT

Lac insects belong to the super-family *coccoidea* (Hemiptera: Sternorrhyncha), commonly known as scale insects or *coccoids*, which comprises of about 7,500 species under variable number of families (20 and above). Globally, ninety species of Tachardiidae have been reported under nine genera. Twenty-one species of *Kerria* have been reported so far. Out of the 14 species of *Kerria* reported in India, only a few are exploited for commercial lac production. Tree-hosts, depending upon their habit, 15-20 years to reach the stage of lac inoculation and hence, do not find favour with the lac growers for raising systematic plantations to grow lac. To cultivate lac on plantation basis, some short stature, fast growing perennial shrubs have been identified for systematic plantation raising and/or integrating with agricultural crops. *Flemingia semialata* Roxberg and *Flemingia macrophylla* Willd have shown great promise for lac production due to its fast growth, tender shoots and suitably for intensive lac cultivation. Being an immobile pest, generating information on biology under the local conditions is essential. Information on crawlers, anal tubercles, respiratory pores and embryonic development were identified. The study is helpful in designing future integrated management of this pest.

Keywords: *Kerria lacca*, Biology, *Flemingia semialata*, *Flemingia macrophylla*

I. Introduction

Lac insects come under the super-family *Coccoidea* (Hemiptera: Sternorrhyncha), commonly known as scale insects or *coccoids*, which comprises of about 7,500 species under variable number of families (20 and above) (Resh and Carde, 2009).The lac insects are mainly distributed in the tropical and sub-tropical regions between the latitudes 40 N and 40 S. Globally, ninety species of Tachardiidae have been reported under nine genera. Twenty-one species of *Kerria* have been reported so far. Out of the 14 species of *Kerria* reported in India, only a few are exploited for commercial lac production,(Sharma and Ramani, 1997).

Lac cultivation has been traditionally carried out on naturally occurring tree-hosts(Dave, 1950). Palas (*Butea monosperma Lamk),* Ber *(Ziziphus mauritiania lam)* and Kusum (*Schleichera oleosa* Lour) are considered major lac-hosts of all India importance, as about 90% of the lac produced in our country comes from these 3 hosts. Besides these 3, there are some other important tree species belonging to Acacia, *Albizia, Ficus* which are utilized for commercial production of lac. However, these hosts lie scattered in the forests leading to difficulties in efficient utilization for production of lac.(Pal *et al*, 2010) To make matter worse, population of these host-trees is decreasing also, that too rapidly due to deforestation and unawareness of their economic potential. Tree-hosts, depending upon their habit, 15-20 years to reach the stage of lac inoculation and hence, do not find favour with the lac growers for raising systematic plantations to grow lac. Moreover, lac culture operations have to be carried out by climbing on to the tree which is cumbersome in the absence of mechanized methods. Lack of skilled man-power in the changing socio-economic scenario is further adding to the woes of lac development. Therefore, to address the above issues and to cultivate lac on plantation basis, some short stature, fast growing perennial shrubs have been identified for systematic plantation raising and/or integrating with agricultural crops. *Flemingia semialata* Roxberg and *Flemingia macrophylla* Willd have shown great promise for lac production due to its fast growth, tender shoots and suitably for intensive lac cultivation. Identification of *semialata* as a potential kushmi lac –host especially for growing winter season (Aghani) lac crop, has come as boon to farmers who do not have lac-hosts but are interested in lac cultivation.

INSECT PROCESSING FOR CONDUCTING STUDIES IN BIOLOGY:

Mature female insects for the study were kept in 100% ethanol for 48 hours at room temperature for dissolving resinous covering. After 48 hours or two working days, insects were individually cleaned with camel hair brush under a stereo zoom microscope and subjected to a series of washes with alcohol to rid off waxy secretions. The cleaned insects were kept in 200µl absolute ethanol in 1.5ml micro-centrifuge tube and stored in -80^0c freezer. The cleaned insects were examined individually for parasitisation before isolation, and taken for biological studies.

LAC INSECT BIOLOGY:

Various stages of embryonic development was studied in the laboratory. Crawler stage was first, one near the anal tubercles and two respiratory pores on the ventral side. Later different appendages were found to arise 8-12 days (Awadh Behari Mishra.1983).

Stages of embryonic development:

The immature ova and opaque were seen about 26 days before larval emergence. During 21-24 days stage, each ovum became elongated and was full of large cells. During 18-21 days stage, differentiation of cells started and a few clusters of small cells appeared. At 16-18 days, cells were not clearly visible but a mass appeared which shifted towards presumptive dorsal side of the body. At 14-16 days, a cluster of cells later on participate on the formation of head. Thorax & abdomen started to move at their respective place. At 12-14 days, presumptive head area was differentiated and a vacuole like head appeared at the anterior end. At 10-12 days stage, body formation takes place. Presumptive leg area (transparent) was visible. At 8-10 days stage segmentation of body on dorsal side was clearly visible. At 6-8 days stage, body was clearly visible into head, thorax and abdomen and quite distinct pinkish yellow coloured legs appeared. At 3-5 days stage, there was bulging of the side. The eyes became quite distinct. At 1-2 days stage before emergence, the larva was fully developed and it was enclosed by membrane only.

Though the embryonic development went on at normal temperature, sometimes when atmospheric temperature few below 15^0c or so the development stopped and embryo remained at the same stage till outside temperature increased. Normally, the period of larval emergence was more or less fixed in an area but sometimes due to climatic factors or broodlac obtained from different places, the time might have varied slightly.

The lifecycle of lac insect starts with its first instar larval stage, called as crawlers in coccid terminology. The first crawler is mobile and it crawls over the shoot of host tree seeking suitable site for settlement and feeding. It has piercing and sucking type of mouthparts. It feeds on phloem sap by piercing it proboscis into the phloem region of shoots. The lac crawlers starts secreting resin in minute quantity within a day after settlement. Except three body openings, the lac insect cover itself completely by its secretion, the lac resin. The three openings are anal tubercle and two respiratory pores. To avoid covering of these hole by resin, the lac insect secretes wax, which is a white thread like structure. Normally 200-300 young lac insect crawlers settle in one square inch area. The male and female insect couldn't be distinguished at this stage.

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