

STUDIES OF SIND-LAC HELPFUL IN ITS CULTIVATION

Part I. Further Studies of Crown-Shaped Cell of Sind Lac Insect

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The lac insect has two species which show a special way of continuing its kind. Mother insects feeding on trees well watered, as during monsoon, grow well in size but give rise to a generation which one and all become winged males. Some larvae are transported singly by flies which come to lac because it also secretes honey dew. As single larvae they become bisexual and construct cells different from those of normal females, growing singly or apart from the main colony, which forms an encrustation. These cells of bisexual insects appear crown-shaped. The lac cell is built on a skeleton of hard wax filaments. In the normal all they grow only upwards from the equatorial region. In the crown shaped cell these wax filaments grow upwards and downwards giving the cell an ornamented appearance. The two species which show the tendency to produce winged males when the mother insects feed on trees well watered would be *Kerria communis* found all over South India and *K. sindica* which has been studied specially in this article.

Keywords: Lac, Insect, Cultivation.

INTRODUCTION

In order to cultivate the lac insect it is imperative to know its biology. In some areas in India lac is only collected when a tree is found infected with it to the extent that it would pay the trouble of collection. In as much as there is a market for lac many have actually tried to propagate it. Now here comes an interesting biological fact. In Mysore State lac is cultivated on *Shorea talura* and the insect being *Kerria mysorensis*. But lac is also found naturally infected on *Ficus mysorensis* and some other host plants, but in this case the species is *Kerria communis*. But no one ever exploits these trees or better stated propagate the insect *K. communis*. Strange enough the same species is found in Hyderabad State usually on *F. bengalensis* Linn and *F. religiosa* Linn. Here again no one takes such brood-lac and infect other trees of the same species on which it was found naturally infected. This negligence has been mistaken for want of enterprize on the part of the collection of lac. In Hyderabad State, near the town of Nirmal up north nearer Berar, lac is regularly cultivated on *Butea frondosa* and the forest department expects as part of the revenue from lac as minor forest produce. Thus both in Hyderabad and in Mysore State lac is cultivated on some trees while it is only collected and never propagated on other trees. The answer to the above paradox is furnished by the biology of the species *K. communis* which is found in both Mysore and in Hyderabad,

I prefer to refer to this species for the Sind lac insect, *K. sindica*, comes very near to *K. communis* in a special

feature of its own. When the female insect feeds on a tree which has apparently received enough water, as in the monsoon season, the growth is excellent but it gives rise to a generation of larvae which are destined to become winged males. The question now arises how does the species manage to exist. The larva in its second stage or perhaps earlier changes its sex and becomes bisexual. When such an insect forms its cell it is special to it and appears like a crown. The usual cell of a full grown female would be round or spheroidal, while the full grown bisexual cell would be ornamented and conceived as crown-shaped.

Fig. 1. shows at the bottom to our right a crown shaped cell. It has given birth to a generation largely constituted of



Fig. 1. A crown shaped or bisexual cell with its progeny comprising mostly of females soon after the third moult or as young adult females.

females. These are already grown up to the stage of having moulted for the last time and become young adult females. Some of them have been enlarged and shown in Fig. 2.

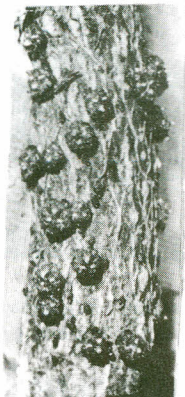


Fig. 2. The cells of young adult females in Fig. 1, shown enlarged.

Very often the larvae that swarm from the crown-shaped mother cell remain close to one another and form a chunk of lac, usually some 3 inches long. In the compound of PCSIR. Laboratories, in Karachi, an *Albizia lebbek* trees was found naturally infected. It is seen in Fig. 3. The generation that arose from it comprised of larvae of winged males. Their evacuated cells are seen on the top and at bottom of the main encrustation as dark encrustation, the cells being very close to one another and can only be seen as dark mass. The scale gives centimeters. There were many more cells of the male further down below which do not appear in the picture, Fig. 3.



Fig. 3. A natural infection of *Kerria sindica* on *Albizia lebbek* which arose from a single crown shaped cell. This encrustation has given rise to larvae of winged males whose cells are seen as dark portions at the top and at bottom of the encrustation scale gives centimeters.

Another crown-shaped cell, like that of Fig. 1, is seen enlarged and from above in Fig. 4. To contrast it, there is Fig. 5, which is the upper half of a normal spherical female cell. This upper half of a normal cell was freed from insect residue and photographed under a low power microscope.

The filaments seen all round are those of hard wax. Such wax filaments form a skeleton around which lac is secreted and the cell is finally constructed. Now if Fig. 4, represents a typical crown shaped cell there are variants like that shown in Fig. 6. In Figs. 4, 5 and 6, an arrow is added to



Fig. 4. A typical crown shaped or bisexual cell seen from above.

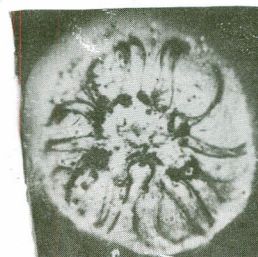


Fig. 5. The upper half or the "dome" of a normal full grown female cell growing isolated. These are tape like filaments of hard wax which form the skeleton around which lac is secreted and the cell is formed.



Fig. 6. A variant of crown shaped cell showing six regions from which hard wax filaments arise dorsally and ventrally. The arrow points towards the anal opening.

point where the anal aperture of the cell is situated. In Fig. 5, the normal cell, the filaments of wax arise only upwards from glands on the equatorial region of the round shaped body, but in the crown shaped cell some filaments arise upwards to form what may be call the dome of the cell and some grow onwards. This feature is partly seen in Fig. 6. There are six such regions or patches of wax secreting pores. Fig. 7 shows two such regions with wax filaments directed upwards as also downwards. It is this feature that



Fig. 7. Hard wax filaments arising upwards as also growing downwards from two regions as seen in Fig. 6.

seems to decorate the bisexual cell which has accordingly been called crown-shaped cell. Now the arrangement of pores that are found in crown shaped cell correspondingly differs from those of a normal female cell. A patch of wax secreting pores of a normal cell is shown in Fig. 8, and that of crown shaped cell in Fig. 9. Thus Figs. 6, 7 and 9 are functionally connected with one another.



Fig. 8. A patch of pores which secrete the hard wax filaments. It comes from a normal full-grown female growing singly.

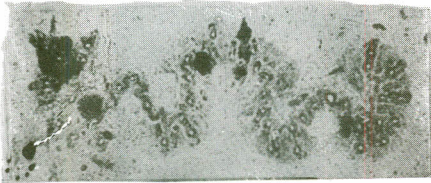


Fig. 9. A patch of pores in a crown shaped cell secreting hard wax filaments as seen in Fig. 7.

Due to the rare occurrence in nature of the bisexual cell its earlier stages or the larval stages could not be observed. Incidentally I found a larval cell which showed the insect with its sides conspicuously bulged. Photographed under a polarizing microscope it showed wax filaments arising from three regions, marked 1 to 3 in Fig. 10. Here

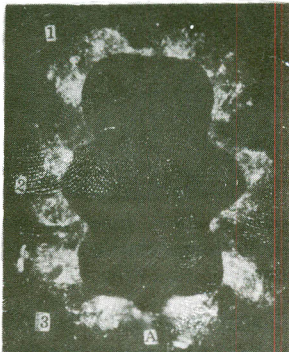


Fig. 10. A larval stage of a bisexual lac insect showing the sides as obviously bulged. From three regions on each side, as numbered, arise wax filaments as pairs. Anal end is indicated as "A".

"A" represents the anal tubercle. I have no doubt that Fig. 10, is the second larval stage of the bisexual insect. A crown shaped cell, of a young adult, shows the same protuberances on each side in Fig. 11. Here three regions are numbered and from each region filaments seem to arise as four flat tapes. Another such cell, further grown, shows in Fig. 12, at region No. 1, four flat projections of wax filaments. Using the polarizing microscope a crown shaped cell, is seen in Fig. 13, with copiously secretions of wax filaments supplementing Fig. 13 there is Fig. 14, which marks the three regions on the right, each apparently comprising of hard wax filaments rather separated from one another.

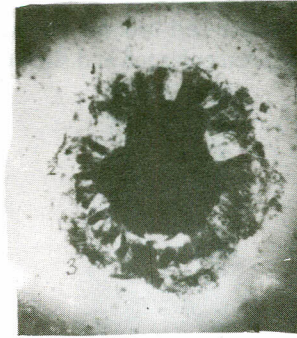


Fig. 11. A young bisexual insect with the middle region bulged out. There are three regions on each side showing wax filaments arise usually as four tape-like pieces.



Fig. 12. A crown shaped cell more advanced than Fig. 11. The wax filaments on each side appear like four pieces of a tape. That numbered 1 is very clear.

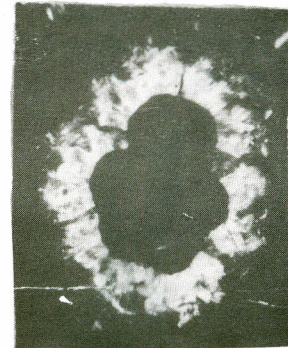


Fig. 13. A crown shaped cell under polarized light shows the full wax secretion of the cell.

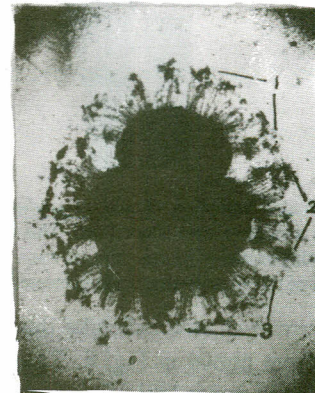


Fig. 14. This supplements Fig. 13 and shows the tape-like appearance of wax filaments from three regions on each side.

other. Fig. 14, than gives the skeleton of wax filaments seen externally in Fig. 6.

The present communication is an extension of the earlier article entitled "The presence of waxes in two kinds of

lac insect" published in 1967.

REFERENCE

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