

THE STAGES OF THE MALE LAC INSECT

(Miss) NOORUNISA QADRI, RAFIUZAMAN and S. MAHDIHASSAN*

P.C.S.I.R. Laboratories, Karachi 32

(Received November 26, 1968)

The findings reported here incorporated a research program on lac cultivation carried out, a few years ago, at the P.C.S.I.R. Laboratories, Karachi. Recently, another centre of research has been established at the P.C.S.I.R. Laboratories, Rajshahi, an area where lac has been growing even in the past.

A change has occurred in the nomenclature of the lac insect; Homoptera; Coccoidea. Varshney¹ points out "that *Kerria*, Targioni Tozzetti, 1884, appears the oldest and valid name for this genus and this change has been approved by the International Commission on Zoological Nomenclature". Unfortunately, the species of lac insects are not properly differentiated, so much so that one, which should now be called, *Kerria fici*, discovered by Green, confirmed by Chamberlin and finally in 1923 by Mahdihassan² has never been recognized by others as distinct, although there has been in India an Institute devoted entirely to the study of lac. Under these circumstances it is useless to raise any fresh controversy and suffice to say that, the paper² of 1923 deals with one, now to be renamed *Kerria sindica*, Madh. Its important feature is that it is the only species of the genus that can be regularly cultivated on *Acacia arabica*, although it has been found, even in the city of Karachi, growing on avenue trees and in gardens on *Abezzia lebbek* and more frequently on *Zizyphus jujuba*.

The present communication is better appreciated as the continuation of observations recorded in two previous articles.^{3,4} They, however, contain only pen and ink drawings, and no photographs, while these offered here present a more realistic picture. The lac insect has two kinds of males, winged and wingless. A generation where males predominate has a larger ratio of winged males. In fact in *Kerria sindica*, a generation may comprise of only males when they are all winged individuals. The future of the species then depends upon sex reversal, when the hermaphrodite appears as a crown-shaped cell, entirely different from the common smooth and round pill-like cell. Then a rough indication of judging the crop of lac to be expected is by finding the ratio of winged male larva in a generation; its less percentage promising a better harvest. The

wingless male larva grows slightly faster than the female but that of the winged male fastest of all. A full grown second stage larva of the winged male *Kerria sindica* is seen in Fig. 1. The larva was naturally found in its cell which was dissolved in alcohol and the bare body of the insect photographed. The main body, long and elliptical, shows a terminal brush of anal ring hairs, and the adjoining surface of the body is a conspicuously flat area. This corresponds to the operculum of the second stage larval cell, as also of the pupal cell. The adult male makes its exit backwards, by lifting a lid, called the operculum, forming the posterior part of the surface of the cell. The presence of such a partition on the posterior dorsal surface of a larval body, as in Fig. 1, easily identifies its sex, as also its being mature enough to moult into the prepupal stage.

The propupa of a winged male lac insect is seen in Fig. 2. At the front and on each side, are elongated projections, representing immature wings. The pupal stage of a wingless male is seen in Fig. 3. An adult, freshly teased out of its cell, is seen in Fig. 4. Thus from Figs. 1 to 4 we have the full grown second stage larva, the propupa, the pupa and the adult; the former two of the winged and the latter three of the wingless male.

The lac insect is also a producer of wax. These waxes require further research. In fact it is still a problem how many kinds of waxes are produced by the male and female lac insects in their different stages. The pupal cell contains an inner lining of a delicate transparent wax, immediately next to the skin of the insect which is not seen in Fig. 5. When the lac resin gets dehydrated it becomes insoluble in alcohol. The pupal cell thus leaves a "ghost" cell of insoluble lac resin which alone is seen in Fig. 5. The adult insect reveals the anal filaments of soft wax protruding outside the broken opercular lid which speaks of its full maturity. The opercular opening, at the posterior upper surface, in Fig. 5, is to be compared with the corresponding upper surface of the skin of the second stage male larva (Fig. 1.) In Fig. 5 the anterior region shows on each side an eye-like slit or cleft, the two being the regions where the brachial plates of the second stage larva were situated. The brachial plates are structures peculiar to lac insects. These structures lie on

*Now at Square Pharmaceuticals Ltd., Pabna, East Pakistan.

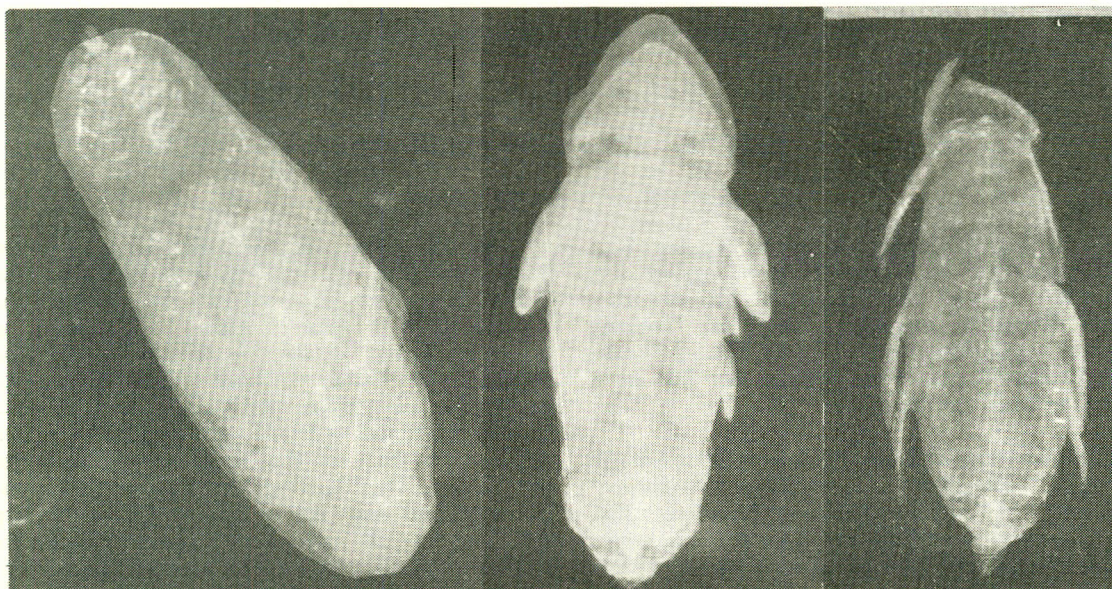


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1.—*Kerria indica*, full grown second stage larva of winged male. Its upper posterior surface shows a clear flat area corresponding with the opercular lid of the cell, through which the adult male makes its exit backwards. The posterior end terminates in a brush of ten anal ring hairs; Fig. 2.—*K. indica*, propupa of winged male. The undeveloped wings are seen as prominent tubular projections, in front, on each side; Fig. 3.—*K. indica*, adult wingless male, freshly teased out of its pupal cell. Note the undeveloped wax filaments at the posterior end.

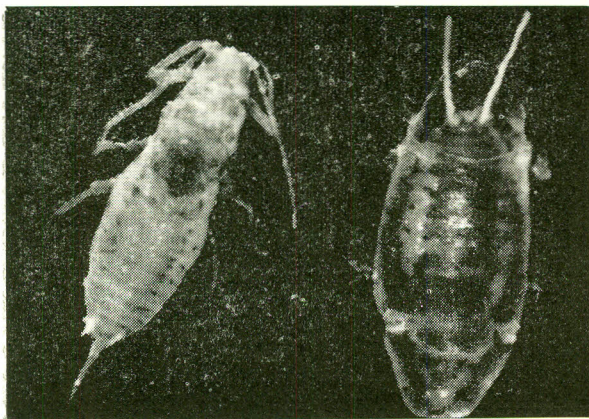


Fig. 4.

Fig. 5.

Fig. 4.—*K. indica*, an adult freshly teased out of its cell.

Fig. 5.—*K. indica*, wingless male in its pupal cell. The opercular lid is open and the terminal wax filaments of adult male are projecting out of it. At the anterior end, on each side, are eye-like "brachial" slits free from lac exudation. see text for further explanation. The cell as a whole represents dehydrated lac insoluble in alcohol.

the dorsal surface of the male larva and are fused pores of wax glands which secrete long threads of soft wax, something like the two wax filaments seen at the posterior end of the adult male, as in Fig. 5, and less so in Fig. 4.

While the brachial plate is on the dorsal surface, intimately associated with it, along the side of the body, is the major spiracle. There is a regular passage connecting the brachium with the major spiracle. In as much as wax production keeps lac-secretion at bay the eye-like partitions, seen in Fig. 5, correspond to area where the brachia were present and where the lac resin was not secreted.

Acknowledgement.—The authors thank Mr. A.H. Chotani, Secretary, Pakistan Council of Scientific and Industrial Research, Karachi, and Dr. Irfan Ali for their interest in this work.

References

1. R.K. Varshney, *The Indian Lac Insect—A Change in Nomenclature*, Ind. J. Entom., **28**, 116 (1966).
2. S. Mahdihassan, *Classification of Lac Insects From a Physiological Standpoint*, J. Sci. Assoc. Maharajah's College, Vizianagram, **1**, 47-99 (1923).
3. S. Mahdihassan, *The Metamorphosis of the Male Lac Insect*, Casopia. Prague, **28**, 5-15 (1931).
4. S. Mahdihassan, *The Males of Lac and Pseudo-Lac Insects*, Zeit. Wiss. Zool., **138**, 371-385 (1931).