

# STUDIES ON THE COLOURS OF THE INTEGUMENT OF SOME INSECTS

ABSTRACT

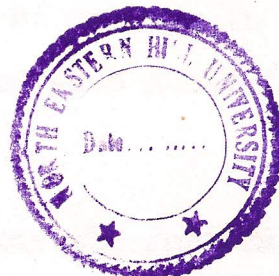
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In the present investigation certain histological, histochemical and biochemical studies have been made on the integuments of the silver-fish, Lepisma sp., the beetle, Podontia rufocastanea (Baly.), the bug Mattiphus oblongus (Dall), the cicada, Terpnosia pseas Walker and larvae of the moth Chelura bifasciata. Studies on the effect of background colours, temperature and hormones have been made in case of Chelura bifasciata. They are summarised as follows:

(1) In order to study the black coloured dorsal integument of Lepisma sp. several histological, histochemical and biochemical analysis were made. To assign the type of pigment responsible for the black colour solubility tests were performed and it was found the pigment is melanin. Studies on the surface pattern of the integument with the help of scanning electron microscope revealed that the black colour of the integument is due to the presence of black granules (melanin) in the scales. Both histological and histochemical studies have shown that the black colour is due to the presence of melanin in the epicuticle. Biochemical extraction of the pigment also shows it to be melanin.

(2) An attempt has been made to study the factors responsible for the red-colouration of the elytra of Podontia rufocastanea (Baly). The surface pattern has been studied with the help of scanning electron and light microscopy. Histological studies were made for the elytral structure. Solubility tests were

performed on the elytra. The pigments have been extracted with suitable solvents and then analysed by means of paper and thin-layer chromatography in order to classify the pigment. It has been found that the red-colour of the elytra is due to  $\beta$ -carotene. The pigment being identified on the basis of its Rf-value, behaviour on the chromatogram, absorption spectrum, etc.

(3) In an attempt to study the causal factor responsible for the green colour of the hemielytron and metallic bluish-green colour of the dorsal integument of the bug, Mattiphus oblongus (Dall.), following studies have been made. For surface pattern both scanning and light microscopy have been made. Solubility tests have been done to find whether the colour <sup>is</sup> ~~are~~ due to pigments. When a portion of the green hemielytron is taken and viewed through transmitted light it is seen that the green colour vanishes. This gives an idea that the colour may be structural. For, further confirmation the hemielytra have been subjected to exhaustive pigment extraction and the crude extract obtained have a very very light coloured solution with yellowish tinge. Since the pigment is present in very negligible amount it could not be separated chromatographically, but from the absorption spectra of the crude extract it may be presumed that the pigment may be a carotenoid and the green colour of the hemielytron is produced by the combination of structural and pigmentary colours. Histological preparations of the hemielytron

have been also made to study the internal structure. Whereas on the other hand the iridescent colour of the dorsal integument is due to diffraction gratings as revealed by scanning electron microscopy.

(4) The transparent wing cuticle of the cicada, Teranosia pseas Walker has been investigated. when is tilted it gives a yellowish reflection. Therefore the surface pattern has been studied with the help of scanning electron and light microscopy. Histological and histochemical tests performed on the transparent cuticle reveal that it is mechanically brittle and rigid, and it is in the endocuticular condition. The wing veins are dark in colour, and probably it is due to melanin.

(5) The integument of the body of the larvae of Chelura bifasciata has yellow and deep blue colours alternately arranged. The former is made up of  $\beta$ -carotene whereas the latter is due to melanin and structural organisation of the cuticle. In this study the effect of environmental factors such as background colours and temperature on the pre-pupal colouration of Chelura bifasciata have been studied. Two types of background, colour experiments were carried out, one at room temperature and the other at high temperature. On the other hand the effect of temperature alone have been made. It has been found that the temperature plays an important role in pre-pupal colouration, whereas the effect of background colours are less

significant.

(6) In the present investigation studies on the effect of  $\alpha$ -ecdysone, Juvenile-II and cyclic AMP on the pre-pupal <sup>hormone</sup> ~~has been done~~ colouration of Chelura bifasciata. The hormones were applied to the last stage larvae by three methods, i.e., by topical application, by dipping method and by intrahaemocoelic injection. Ligature experiments were also carried out. It has been found that  $\alpha$ -ecdysone and cyclic AMP enhance depigmentation of the blue and yellow colour, whereas Juvenile hormone II inhibits depigmentation.

In addition to these the causal factors responsible for the blue and yellow colour of the larvae of Chelura bifasciata have also been investigated. It has been found that the yellow colour is due to the presence of  $\beta$ -carotene as revealed by biochemical analysis, whereas the blue colour is a combination of pigmentary (melanin) and structural colour. Surface pattern of the dorsal integument of the larva has been studied with the help of scanning electron microscope. Histological and certain specific histochemical and biochemical studies have been made on the blue and yellow portion of the larval integument which also shows that the blue colour is due to melanin and structural <sup>of the cuticle</sup> organisation, and the yellow colour is due to  $\beta$ -carotene.

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