Preadult Changes of Ecdysteroid and Juvenile Hormone Titers in Relation to Diapause and Pigment variations in two Lepidopteran Species, Cerura vinula and Araschnia levana (Lepidoptera: Notodontidae /  Nymphalidae)

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Ecdysteroids and juvenile hormone titers were determined through preadult development and set in relation to changes and variations in pigmentation in 2 lepidopteran species: Cerura vinula (Linnaeus 1758) a species with different color patterns in successive larval instars and Araschnia levana (Linnaeus 1758) a species with facultative pupal diapause and adult seasonal diphenism of wing coloration.

In C. vinula larvae, the black melanin in the color pattern is stepwise reduced at successive molts. The last instar larva \( L_5 \) turns dark red at the wandering stage. Peaks in hemolymph ecdysteroids \( ES \) correspond to larval molts. The reddening prior to pupation corresponds to a small \( ES \) peak followed by the large pupation peak. - The juvenile hormone \( JH \) titer decreases with every larval instar and altogether becomes lower in every successive instar. At the middle of the \( L_5 \) stage, it decreases to an undetectable level and increases again immediately before pupation. The results are in accordance with the assumption that morphological differences between successive larval instars can be controlled by a stepwise decrease of the \( JH \) level, while the reddening at the wandering stage is caused by a small \( ES \) peak during entire absence of \( JH \).

In A. levana, short-day larvae develop to diapause pupae and the red spring-morph adults. Long-day larvae become non-diapause pupae and black and white summer-morph adults. In last instar larvae determined for non-diapause an earlier increase of \( ES \) than in diapause prepupa corresponds to an earlier pupation. Their adult development is initiated by an \( ES \) increase one day after pupation and leads to the black and white summer-morph. By contrast, in diapause pupae, \( ES \) remain low during pupal diapause and only after months rises inducing adult development to the red spring-morph. \( JH \) titer are high in the middle of the penultimate larval instar and then decrease in all larvae. In the \( L_5 \), \( JH \) titer decreases within 2 days to an undetectable level. In diapause larvae, it remains low until pupation. Only in non-diapause larvae, it increases again before pupation. This prepupation \( JH \) peak and the earlier \( ES \) release are the main differences to diapause development. Presumably, one of them or both may determine non-diapause development and thereby finally the summer-morph adult.

Key words: Ecdysteroids - juvenile hormone-titer - diapause - color pattern - color change - Cerura vinula - Araschnia levana

* This paper is dedicated to the memory of Hans Piepho (1909-1993)