ANATOMICAL AND HISTOLOGICAL CHANGES DURING DORMANCY IN TWO COCCINELLIDAE (*)

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The gonads of both females and males of *Semiadalia undecimnotata* SCHNEID. were studied during the estivo-hibernation period (August - May). The ovaries remain unripe in diapausing females, the ovarioles being formed by mere germaria until late April (or early May) when the previtellogenesis begins. In some years, the stage of the first oocyte is attained in females staying still in the hibernation quarters. On the contrary, both the spermatogenesis and spermateliosis proceed in the testes of diapausing males so long as the ambient temperature is sufficiently high (August - September, April - May). Only in the coldest period of dormancy (November - March) the tissue of testicular follicles ceases to be active. Since mid-April the spermatogenesis and spermateliosis are resumed completely and the males fertilize the females, as is shown by dissections of their spermathecae. Seminal vesicles are always full of sperms. The digestive tract is empty in inactive coccinellids and the size of the fat body gradually diminishes in the course of estivo-hibernation.

The dependence of the activity of the tissue of testicular follicles on the ambient temperature was proved experimentally in both *S. undecimnotata* and *Coccinella septempunctata* L. The temperature of +12°C enables a natural regression, while an abrupt transfer to +5°C renders gradual emptying of follicles impossible.

Entomophagous coccinellids are adapted to the alternation of favourable and adverse conditions of climate and particularly of food, by year cycles appropriate to particular distribution areas. A period of development alternates with developmental arrest which is expressed as hibernation in the temperate zone and as estivation in the tropical and subtropical zone. Both types of arrest may combine into one long resting period, estivohibernation (or semi-estivohibernation) which lasts about nine months.

This is literally true for *Semiadalia undecimnotata* SCHNEID. which is dormant from late July or early August till early or middle May, being a "hypsotaactict" aggregator: the aggregations of hundreds to thousands beetles are formed every year in the same dormancy sites (usually on top of prominent hills) which they reach by optically oriented directional flight (HODEK, 1960, 1967). As this behaviour is convenient for continual sampling, this species has been used for the research on changes during dormancy — of body composition (HODEK & CHERKASOV, 1961, 1963), of diapause intensity (HODEK,

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1970), of metabolic rate (HODEK & SLAMA, unpubl.) and of frost resistance (HODEK, unpubl.).

The study of anatomical and histological changes in gonads is essential because the arrest of their development, especially in females, is the most conspicuous criterion for imaginal diapause. Thus far only preliminary results of the dissections of S. undecimnotata (HODEK & CHERKASOV, 1958) have been published.

The hibernation behaviour of C. septempunctata L. is highly variable as to the choice of dormancy sites, to the size of aggregations, and to the onset and end of dormancy (HODEK, 1960, 1967). This species also prefers elevated localities; it, however, may hibernate also in the lowland near the forest edges or near groups of shrubs. The aggregations are much smaller than with S. undecimnotata and they are formed near or in the upper layer of soil. Thus the hibernating coccinellids are covered by snow and cannot be sampled continually. The dissections of autumnal and spring samples have already been published (HODEK & CHERKASOV, 1961). Here we studied only the effect of temperature on the testes of beetles collected in autumn.

Materials and methods

The coccinellids were sampled in the hibernation quarters in Louny-hills (northern Bohemia, near the town Louny), Pavlov-hills (southern Moravia, near the town Mikulov), Tribeč-hills (western Slovakia, near the town Nitra). For dissection of spermathecae the males and females were transported separately (except for the 1957 season). They were dissected under the Ringer's solution with the aid of a stereomicroscope where the fat body and the alimentary canal were evaluated. The prepared ovarioles, testicular follicles and smears from the spermatheca and from seminal vesicles were then examined by the phase contrast.

When preparing testicular follicles for taking photographs, we removed the membrane of the testes. Bundles of follicles were cut with a scalpel, till rosettes containing 2-4 follicles were left. Whole mounts were prepared in the physiological solution, single follicles were photographed by a phase or interference phase contrast. A different compression enables different details to stand out. The differences arise most conspicuously by comparison of figures 1 and 2.

Results

Ovaria

The ovaries remain unripe during the dormancy in outdoor conditions (Tab. 1). The ovarioles are formed by mere germaria having thin pedicels. The ovary is densely interwoven by tracheae and immersed in a massive fat body.