

Activity of the Incretory Centres of *Locustana pardalina* during Embryogenesis: Function of the Prothoracic Glands

EVIDENCED in insects is the existence of a tripartite endocrine system, and a composite hormonal mechanism. A brain factor liberated by the neurosecretory cells of the pars intercerebralis induces the prothoracic glands (ventral glands, pericardial glands, lateral cells or peritracheal glands of Weismann) to secrete their contributive hormone¹. There is also abundant proof that the 'juvenile hormone' of the corpora allata promotes differentiation and growth in the larval direction². However, there was much that still remained obscure about the particular function of the hormone secreted by the prothoracic glands.

The discovery of a pair of distinct glandular organs (prothoracic glands) in embryos of *Locustana pardalina* led to investigating the activity of the different incretory centres in relation to each other, and to the moult of provisional cuticle during embryogenesis.

Dried eggs of *Locustana* containing dormant embryos were wetted and kept at 30° C., 100 per cent relative humidity. Exposure to these conditions was responsible for a re-commencement of development. This was accompanied by a conspicuous enlargement of the neurosecretory cells. They maintained obvious histological signs of maximal secretory activity for 72 hr. After 96 hr., when katatrepsis was completed, their activity subsided, and thereafter it became practically impossible to distinguish them from ordinary nerve cells.

The prothoracic glands were first located with confidence on the completion of katatrepsis. They reached their maximal size and activity in the cycle 24 hr. later. The nuclei became more densely stained, and many of them became enlarged and slightly lobulated. However, the main point of interest was that this period of maximal activity of the glands coincided with the retraction of the epidermis from already formed cuticle. Thereafter, the glands became noticeably reduced in size, and at the time of emergence they were less than half their former peak size.

The corpora allata obtained their customary form and position on each side of the oesophagus in 96 hr. They showed no visible histological changes.

In view of the observed correlation between the maximal activity of the prothoracic glands and the embryonic moult, ligaturing tests were attempted on dissected-out embryos which had just completed katatrepsis. This was about 24 hr. before they were normally due to moult. The detached provisional cuticle resulting from the moult formed an easily detectable envelope. In four cases in a batch of twenty ligatured between the thorax and the abdomen, and examined 24 hr. later after being kept moist with isotonic solution, the thorax, but not the abdomen, moulted. Attempts to isolate the head gave uncertain results, but in two cases in a batch of twenty-two the body only appeared to moult.

Important conclusions to be drawn from the above evidence are as follows. First, the effectiveness of wetting the eggs terminating dormancy may be explained in terms of an action of moisture inducing the brain to liberate a developmental factor. Chilling the brain of the *Cecropia* silk-moth produces the same effect¹. Secondly, the tissues were made competent to differentiate prior to the proper form-

ation of either the prothoracic glands or the corpora allata. Thirdly, subsidence in the activity of the neurosecretory cells was followed by the prothoracic glands attaining their maximal size and activity. These glands appeared to be exclusively responsible for the retraction of the epidermis from its cuticle.

It is hoped to publish the details elsewhere with Mr. Sharan of this Department. Dr. Matthée, of the Agricultural Research Institute, Pretoria, very kindly made the locust egg-pods available for this work.

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¹ Williams, C. M., *Biol. Bull.*, **93**, 89 (1947).

² Wigglesworth, V. B., *J. Exp. Biol.*, **29**, 620 (1952).

Sorghum Midge and Resistant Varieties in the Gold Coast

FAILURE of *Sorghum* to set seed has occasionally been noted in annual reports of the Gold Coast Agricultural Department, and attributed to climatic conditions. In view of the importance of this crop in the Northern Territories, investigations were commenced and have shown that this failure is due primarily to attacks by the sorghum midge, *Contarinia sorghicola* Coquillett.

Preliminary results from sample surveys showed increasing infestation as the flowering season progressed. A range of from approximately 20 per cent midge-infected grains in early-flowering varieties to 80 per cent in a late-flowering crop was recorded at the Nyankpala Agricultural Station, Tamale (9° 25' N., 0° 95' W.) in 1952. Comparable figures were obtained at Manga Agricultural Station, Bawku (11° 5' N., 0° 15' W.).

Variety plots indicated the value of early flowering as an escape from attack; but in addition one group of varieties showed apparent resistance. This group—of which Nunaba is the typical variety—has certain distinctive characters, including long papery glumes which do not normally open at anthesis. It appears that, as a result of this, the midge has difficulty in ovipositing within the glumes.

Sample counts showed 3 per cent infestation in Nunaba compared with 35 per cent in a variety which flowered normally at the same time.

A further result of the non-opening of the glumes is that natural hybridization rarely occurs. This character would have the additional practical advantage, therefore, of facilitating the maintenance of pure varieties.

The lack of natural hybrids may account for the fact that varieties with this character, which differ from one another only in minor details, are found only in the North-Eastern District of the Gold Coast.

In an effort to introduce the non-opening glume character into a wider range of types, a number of crosses have been made involving Nunaba and related varieties. It is difficult to collect pollen from these since the anthers remain enclosed within the glumes, but they may readily be used as female parents provided the glumes are clipped to expose the stigma immediately before pollination.

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