

Ultrastructure of the internal reproductive organs in the female phalate adult and the sperm in the ovipositing moth of *Bombyx mori* (Insecta: Lepidoptera)

Keiichiro MIYA

Laboratory of Applied Entomology, Faculty of Agriculture

Iwate University

Ueda, 3-18-8, Morioka, 020 Japan

The internal reproductive organ of the female phalate adult and the features of sperms in the spermatheca and the vestibulum of the ovipositing moth were observed with electron microscopy.

While the chitinous internal membrane was not formed in the oviduct derived from mesoderm, it existed in all ectodermal organs. But the structures of the organs were different from each other; the membrane of bursa copulatrix was conspicuously thick and tough and it was also thicker but softer in the large lobe of spermatheca and the vestibulum. In the latter it seems to be jelly-like.

The musculature did not exist in the spermathecal gland, excretory tubes of mucous gland, and the bursa copulatrix. While the spermatheca and the reservoir and the common duct of mucous gland were covered only with a few muscle cells, the oviduct, the ovipositor, the seminal tube, and the spermathecal duct were enclosed by several layers of the developed musculature. In the phalate adult the fat cells were seen to intervene between the musculature and the epithelium, but they disappeared at eclosion.

In the gland cells of spermatheca and mucous gland there was a reservoir constituted of abundant microvilli and a duct produced by cuticular substance. The former was formed from duct cell, while the latter was derived directly from the gland cells. Further, among the gland cells the supporting cells were intervened and secreted a cuticular membrane. In the present observation the secretion already began and the relatively large amount of secretion was found in the bursa copulatrix, the small lobe of spermatheca, and the common duct of mucous gland.

The sperms ejaculated into the bursa copulatrix were seen to migrate through the seminal tube and reached the vestibulum, and then subsequently ascend the spermathecal duct to enter into the large and small lobes of spermatheca. Such migration of sperms seemed to be as due to a peristaltic movement in the musculature of the seminal tube and of the spermathecal duct. As reported previously (Friedländer and Gitay, 1972; Miya, 1982), the sperms were seen to descend through the spermathecal duct to the vestibulum and then entered into the egg, but they shed their thick envelope before descending while they were still at the lower part of the large lobe. The lower part of the spermathecal duct was divided into main canal and fertilization canal, and this double structure of the spermathecal duct has been considered to serve so as to separate the incoming sperms from the outgoing sperms (Omura, 1938; Callahan and Cascio, 1963; Outram, 1971). However, the present observation suggested that the migration of sperms through the vestibulum was not sufficiently ordered. Many sperms, both eupyrene and apyrene sperms, were seen to penetrate not only into the internal membrane of vestibulum, but also into the epithelial cells. Among these sperms, only those that have shed their envelope could pass through the micropylar canal and enter into the egg.

References

- Callahan, P. S. and Cascio, T. (1963) *Ann. entomol. Soc. Amer.*, **56**, 535–556.
 Friedländer, M. and Gitay, H. (1972) *J. Morphol.*, **138**, 121–129.
 Miya, K. (1982) In: "*The Ultrastructure and Functioning of Insect Cells*", (Akai, H., King, R. C., and Morohashi, S. eds.), pp. 49–52, Soc. Insect Cells, Tokyo.
 Omura, S. (1938) *J. Fac. Agric., Hokkaido imp. Univ.*, **38**, 151–181.
 Outram, I. (1971) *Can. Entomol.*, **103**, 32–43.