Proc. Arthropod. Embryol. Soc. Jpn. 42, 27–28 (2007)

ISSN 1341–1527

Ultrastructure and Formation of Ball-shaped Structures in the Oocytes of Phlaeothripine Thrips *Bagnalliella yuccae* (Hinds) (Insecta: Thysanoptera)*

Ayumi NAGASHIMA[1] **and Tadaaki TSUTSUMI**[2]

[1] *Biological Laboratory, Graduate School of Education, Fukushima University, Fukushima, Fukushima 960–1296, Japan*
[2] *Department of Environmental System Management, Faculty of Symbiotic Systems Science, Cluster of Science and Technology, Fukushima University, Fukushima, Fukushima 960–1296, Japan*
E-mail: thrips-tsutsumi@sss.fukushima-u.ac.jp (TT)

Bournier (1966) found a small ball-shaped structure in the ooplasm of early eggs of an idolothripine thrips *Caudothrips buffai* (= *Bactrothrips buffai*). He called it "mycetome", from its morphological resemblance to the cluster of symbiotic microorganisms in eggs as reported for Hemiptera (bugs, planthoppers, and aphids) that constitute a sister-group of Thysanoptera. In the oocytes of another idolothripine thrips *Bactrothrips brevitubus*, Haga (1985) also found a similar structure formed by the aggregation of granules, but these granules aggregated to bipolar positions to form two ball-shaped structures. Tsutsumi (1995) reported ball-shaped structures in oocytes of a phlaeothripine thrips species and 12 idolothripine thrips species. The ball-shaped structures in the phlaeothripine thrips *Bagnalliella yuccae* were positively stained with some dyes, such as hematoxylin, Feulgen's reaction and Hoechst dye 33342 that react specifically with DNA. However, those structures in idolothripine thrips, *e. g.*, *Bactr. brevitubus* and *Holurothrips morikawai* were not stained or were only very weakly stained (cf. Tsutsumi and Haga, 1991). Thus, the stainability to the DNA detectable dyes in the ball-shaped structures of *Bagn. yuccae* was different from that of the idolothripine thrips. Cytochemically and ultrastructurally, Tsutsumi *et al*. (1994) revealed that the ball-shaped structures in *Bactr. brevitubus* were lysosomal aggregations rather than symbiotic microorganisms. On the other hand, our knowledge on the ball-shaped structures in *Bagn. yuccae* is limited to their stainability. In the present study, we describe the ultrastructure and formation process of the ball-shaped structures in *Bagn. yuccae*.

Adult females of *Bagn. yuccae* were collected from *Yucca gloriosa* (Agavaceae) in Matsukawa, Fukushima Prefecture, Japan. Whole-mount preparations of the ovaries dissected out of female bodies were observed under a light microscope. Some other ovaries were processed into preparations for transmission electron microscopy by conventional procedures (cf. Sudo and Tsutsumi, 2002) and observed under a TEM (JEOL, JEM 1010) at 80kV.

Light microscopically, a few small red-colored granules (*ca*. 0.5 μm in diameter) appeared in the oocytes ~70 μm in diameter. As oogenesis proceeded, they increased in number, and condensed and aggregated to bipolar positions in each oocyte approximately 180 μm in its long axis to form two red-colored ball-shaped structures. Even after two ball-shaped structures had been formed in the ooplasm, the granules continued to increase in number and the structures to grow. The structures reached their definitive size of *ca*. 20 μm in diameter in each oocyte approximately 210 μm in its long axis.

Electron microscopy demonstrated that; 1) the ball-shaped structure is not surrounded by any membranous structure, 2) each granule of the ball-shaped structure is surrounded with only a unit membrane, and with no additional structure such as cell wall, 3) the granules are 0.4–1.0 μm in diameter and include no organellar structures, 4) the central and cortical regions of the granule exhibit high electron-density, but intermediate region (arrows in Fig. 1) shows somewhat lower electron-density, and 5) numerous mitochondria (Mt in Fig. 1) are found between the granules. These numerous mitochondria may cause the positive stainability of the ball-shaped structures with hematoxylin, Feulgen's reaction and Hoechst dye 33342 as shown in Tsutsumi and Haga (1991).

The ultrastructure of the granules in oocytes of *Bagnalliella yuccae* suggests that the ball-shaped structures were not derived from symbiotic microorganisms. We have future plans to examine the acid phosphatase activity in the ball-shaped structures of

* Abstract of paper read at the 42nd Annual Meeting of the Arthropodan Embryological Society of Japan, June 1–2, 2006 (Tsuchiyu, Fukushima).

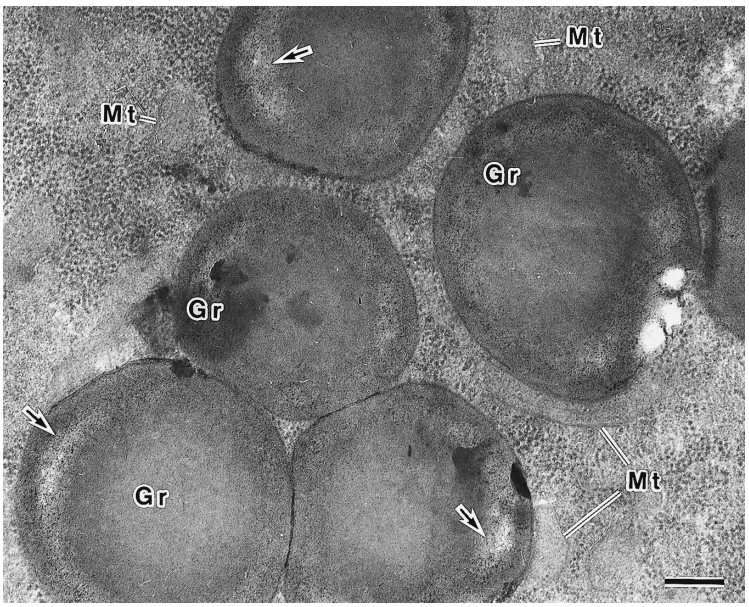

Fig. 1 Transmission electron micrograph of granules of the ball-shaped structure. Each granule (Gr) is surrounded with only a unit membrane and includes no organellar structure. Note that numerous mitochondria (Mt) are found in the spaces between the granules. Arrows show a lower electron-dense region of the granules. Scale = 200 nm.

Bagn. yuccae, to test the possibility that they are also aggregations of lysosomes as in the idolothripine thrips *Bactrothrips brevitubus*.

References

Bournier, A. (1966) *Ann. Soc. Entomol. Fr, N. S.*, **11**, 415–435.

Haga, K. (1985) *In* H. Ando and K. Miya (eds.), *Recent Advances in Insect Embryology in Japan*, pp. 45–106. Arthropodan Embryological Society of Japan, Nagano. (K. K. ISEBU, Tsukuba)

Sudo, M. and T. Tsutsumi (2002) *Proc. Arthropod. Embryol. Soc. Jpn.*, **37**, 35–41.

Tsutsumi, T. (1995) *Phylogenetic Aspects of the Ovariole Type of the Thysanoptera (Insecta), Based on the Morphology of the Postembryonic Development in* Bactrothrips brevitubus. Doctoral Thesis, Institute of Biological Sciences, University of Tsukuba, Tsukuba.

Tsutsumi, T. and K. Haga (1991) *Proc. Arthropod. Embryol. Soc. Jpn.*, **26**, 17–18.

Tsutsumi, T., M. Matsuzaki and K. Haga (1994) *J. Morphol.*, **221**, 235–242.