BACTERIOIDS AT THE SITE OF NERVE SEVERANCE IN THE COCKROACH *PERIPLANETA AMERICANA*

IN an investigation on the incidence and peculiarities of the "tumors" of the salivary glands induced by the severance of the recurrent nerve in *Periplaneta americana*, an accumulation of micro-organisms in the haemocytes and lobes of fat bodies at the site of the operations has been found. Within two to three weeks after nerve severance, accumulation of opaque, whitish masses becomes well defined on the lobes of the salivary glands. The insects were normal in behaviour and there was no overfeeding (hyperphagia). In the fat bodies lie the mycetocytes lodging bacterioids of variable size and shape, but in the haemocytes the bacterioids appear to lie free in the cytoplasm. The bacterioid cytoplasm appears granular and faintly dense with patches of reduced electron-opacity. The cell wall of these is well defined, with opaque and lucent layers (Fig. 1) ; fission stages occur in large numbers, with distinctly recognisable mesosomes. Pleomorphic changes are noticeable. In both sexes of *Periplaneta*, but predominantly in the female, stages similar to metamorphosing bacterioids have been recognised, mostly lying in the peripheral cells of the salivary glands. The insects seem not to be affected in their reproduction.

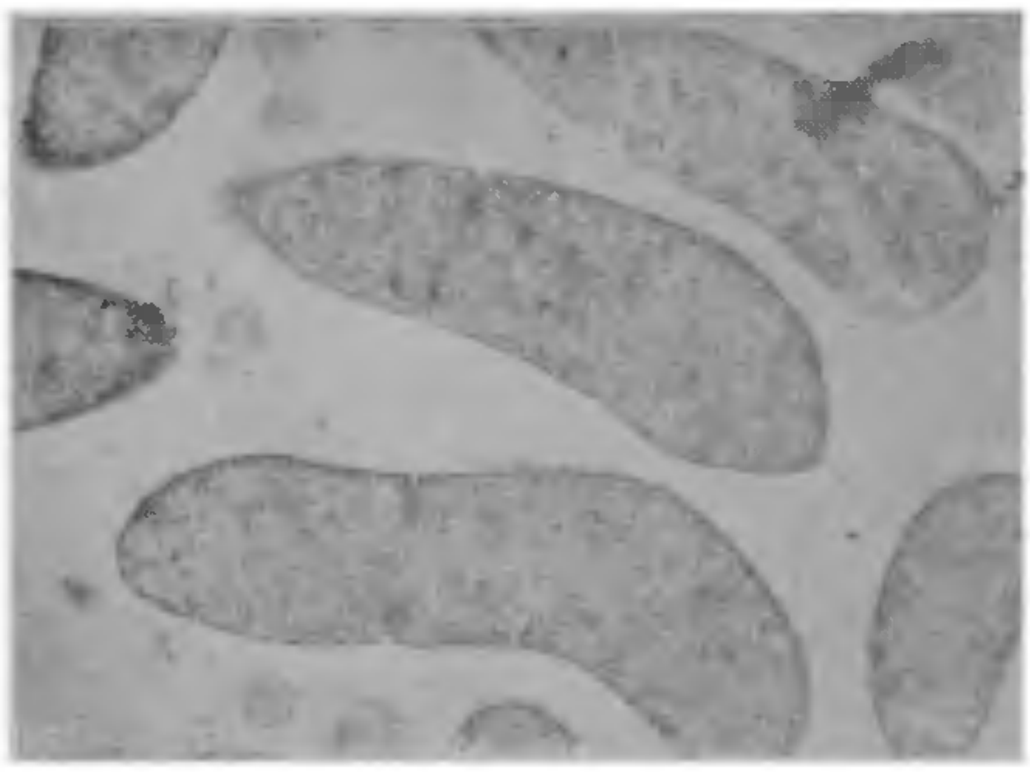


FIG. 1. Bacterioids in the fat body lying adjacent to the site of nerve severance in *Periplaneta americana*. Electron Micrograph. After 16 days of operation, × 38,000.

The bacterioids appear to be *Blattabacterium cuenoti* Hollande and Faure, the type species of the only known symbiote of blattids[1]. The pleomorphs and the metamorphosing forms appear to be similar to the ones recorded by Milburn[2] in *Periplaneta*. These micro-organisms in association with haemocytes, accumulating after nerve severance, indicate foci of inflammation. Hyperphagia has not been observed in the experimental *Periplaneta*, though nerve severance induces this in *Phormia*[3]. The recurrent nerve is both a neural and a neurosecretory pathway[4,5] and so its severance would deprive of the neurosecretory supply to the gut also. It is known that neurosecretory material promotes synthesis of glycogen from sugar[6] and as the salivary glands show a very high concentration of glycogen in electron micrographs, the bacterioids perhaps migrate and metamorphose in their cells. In the experimental animals, the fat bodies show a considerable depletion of glycogen, leading on to adverse effects, and Walker[7] has pointed out that in cockroaches, glycogen depletion following starvation affects the mycetomes leading on to their disappearance.

The accumulation of symbiotic bacteria in haemocytes and the salivary cells, subsequent to the sectioning of the nerve, is recorded for the first time.

Dept. of Zoology,
Univ. of Kerala,
Karyavattam,
Trivandrum, *July* 23, 1971.

K. K. NAYAR.
A. C. FERNANDEZ.

1. Brooks, M. A., *J. insect Pathol.*, 1970, **16**, 249.
2. Milburn, N. S., *Ibid.*, 1966, **12**, 1245.
3. Dethier, V. G. and Gelperin, A., *J. Exp. Biol.*, 1967, **47**, 191.
4. Nayar, K. K , *Zeits. Zellf.*, 1956, **44**, 697.
5. Thomsen, M., *Ibid.*, 1963, **94**, 205.
6. Van Handel, E. and Lea, A. O., *Science*, 1965, **149**, 298.
7. Walker, P. A., *J. Insect Physiol.*, 1965, **11**, 1625.

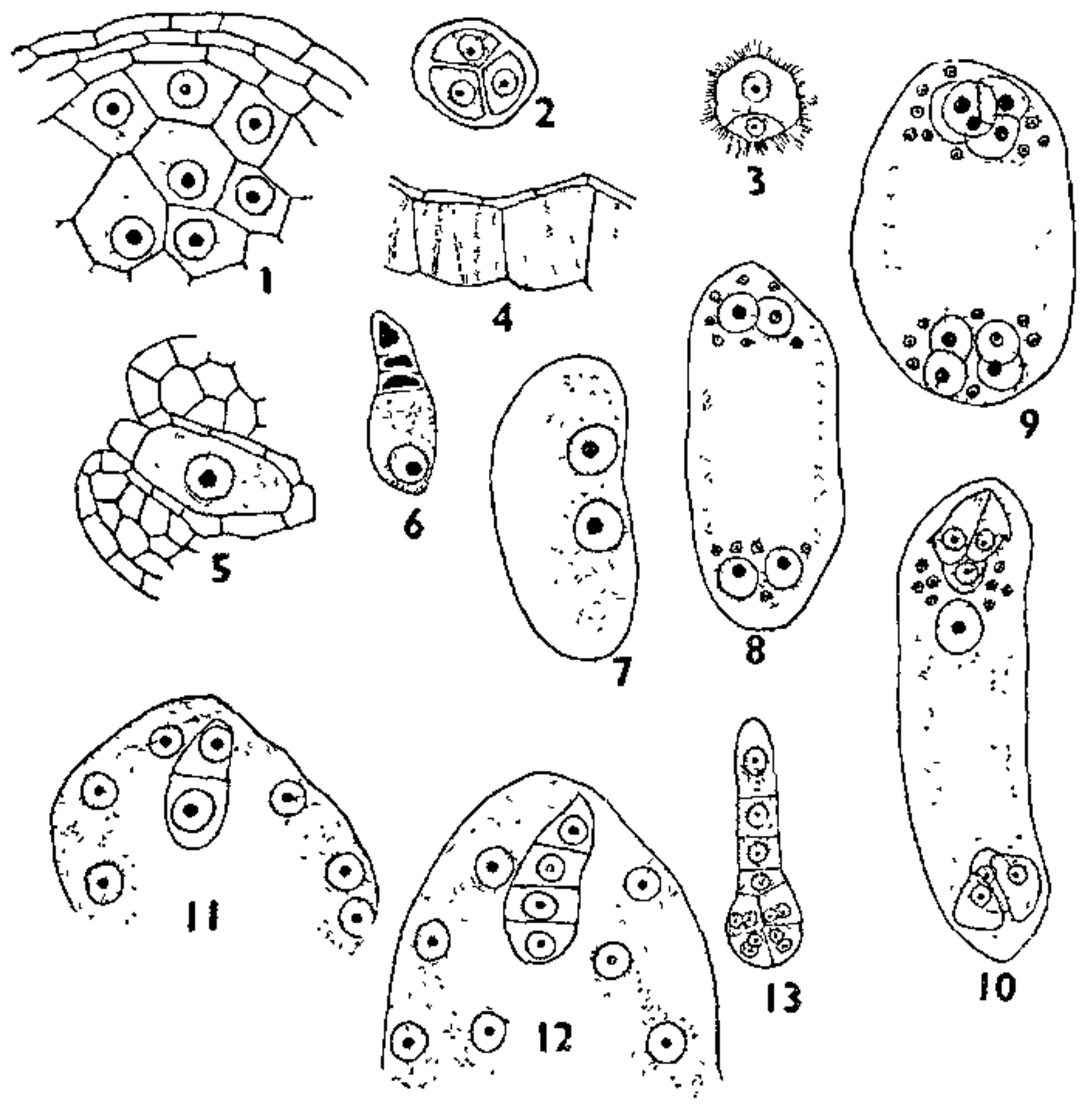
A CONTRIBUTION TO THE EMBRYOLOGY OF *ANOTIS WIGHTIANA* WALL

THE family Rubiaceae exhibits features of embryological interest[1-6]. The present paper deals with certain aspects of embryology of *Anotic wightiana*.

The transection of a young anther lobe shows that the wall of the anther is made up of epidermis, endothecium, a middle layer, and tapetum (Fig. 1). The tapetal cells are uninucleate throughout and are of glandular type. Pollen mother cells undergo meiosis and form tetrads of spores. The microspore tetrads show tetrahedral arrangement (Fig. 2).

The mature pollen grain is bi-celled with thick exine and thin intine (Fig. 3). The

endothecium becomes fibrillar at the time of anther dehiscence (Fig. 4).



FIGS. 1–13. Fig. 1. T.S. of young anther lobe showing wall layers and microspore mother cells, × 500. Fig. 2. Tetrahedral arrangement of microspores. Fig. 3. Two-celled pollen grain, × 750. Fig. 4. Fibrillar endothecium, × 225. Fig. 5. Megaspore mother cells, × 500. Fig. 6. Linear tetrad of megaspores, × 500. Figs. 7–10. Stages in the development of embryo-sac, × 500. Fig. 11. First division of egg, × 500. Fig. 12. Filamentous pro-embryo of four cells, × 500. Fig. 13. Octant stage of embryo, × 500.

The ovary is inferior, bicarpellary, bilocular with two hemianatropous ovules in each locule. The ovules are unitegmic, tenuinucellate, on axile placenta. The nucellus can be classified under the *Oldenlandia*-type[1].

A single hypodermal archesporial cell is differentiated, which directly functions as megaspore mother cell (Fig. 5). The megaspore mother cell undergoes two meiotic divisions to give rise to linear tetrad of megaspores (Fig. 6). Of the four megaspores, the chalazal one becomes functional and upper three degenerate. The nucleus of the functional megaspore undergoes three mitotic divisions to form an 8-nucleate embryo-sac (Figs. 7–10). Starch grains begin to appear at 4-nucleate embryo-sac stage. In the mature embyo-sac the synergids are pear-shaped and are beaked, and egg cell is ovoid. The antipodals are organised as cells, large and of equal size. The secondary nucleus is situated very near the egg.

Fertilization is porogamous. The antipodals degenerate after fertilization as in *Knoxia*[6], *Ophiorrhiza*[3], *Oldenlandia*[2,6], *Pavetta*[1].

The endosperm is *ab initio* nuclear.

The fertilized egg divides transversely producing the terminal cell *Ca* and basal cell Cb. The cell Cb by two transverse divisions gives rise to a row of four cells *d*, *f*, *n*, *n'*. *Ca* then divides to form quadrants and octants (Figs. 11–13). The embryogeny conforms to Solanad type. The suspensor is short constituting of 4 cells.

My thanks are due to Prof. S. Shamanna for encouragement and to Rev. Fr. A. P. Menezes, S.J., Principal, for providing me the facilities. My thanks are also due to Mr. A. S. Rao, Regional Botanist, B.S.I., for sending me the fixed material, and to the U.G.C. for financial assistance.

Department of Botany, G. SHIVARAMIAH.
St. Joseph's College,
Bangalore-1, *May* 8, 1971

1. Fagerlind, F., *Acta Horti Bergiani*, 1937, **11**, 195.
2. Farooq, M., *Curr. Sci.*, 1958, **22**, 280.
3. Gopinath, P. M. and Chennaveeraiah, M. S., *J. Karnatak Univ. (Dharwar) Sci.*, 1961, **6**, 61.
4. Lloyd, F. E., *Mem. Torr. bot. Cl.*, 1899, **8**, 1.
5. Raghavan, T. S. and Rangaswamy, K., *J. Indian bot. Soc.*, 1941, **20**, 341.
6. Shivaramiah, G. and Ganapathi, P. S., *Curr. Sci.*, 1961, **30**, 190.

A DIPLOID *CHLOROPHYTUM ORCHIDASTRUM* FROM GHANA (AFRICA)

THE genus *Chlorophytum* Ker-Gawl is represented by about forty-two species of evergreen perennials widely distributed in tropical and sub-tropical regions of the world (Chittenden, 1965, 1969). Thirteen species of the genus are reported to occur in the Indian subcontinent, a few of which are apparently endemic (Hooker, 1892 ; Santapau and Fernandes, 1955). Cytologically the species fall into two series in respect of their chromosome number, one with seven as basic and the other with eight. Of these, the species *C. orchidastrum* Lindl is allopatric and reports on its cytology have come from different countries. These show that the species falls under the 7 basic series and reveals an interesting situation with respect to its distribution. Baldwin and Speese (1951) working on the cytogeographical aspects of *Chlorophytum* in Liberia have reported the chromosome number of *C. orchidastrum* as $2n = 28$ and have considered the species a tetraploid with seven as the basic number. Larsen (1963) has reported the chromosome number of the same species from Thailand as