



HOKKAIDO UNIVERSITY

Title	アシマダラフキバツタ (Podisma sapporoense SHIRAKI)の幼蟲に見出されたるovo-testisに就て
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ON AN OVO-TESTIS¹⁾ FOUND IN A LARVA OF LOCUST, *PODISMA SAPPOROENSE* SHIRAKI.

BY

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(With one Plate)

In the suburbs of Sapporo, *Podisma sapporoense* SHIRAKI is found abundantly. During the investigation of chromosomes of this locust in 1927, I found by chance one case of an ovo-testis in fifty males examined. In the adult of the insect, the size of the female is considerably larger than the male, but in the larva, especially in the early stage, the sexual difference can scarcely be distinguished by the body size. Therefore, identification of the sex of the larva is secured only by the external genital organs. By this method, it is ascertained that the gynandromorphic locust under consideration is a normal male in appearance.

In insects, many investigators such as JUNKER (*Perla* 1923), BOVERI (Bee 1888), WHITTING (*Habrobracon* 1927), MORGAN and BRIDGES (*Drosophila* 1927), PEARSON (Katydid 1927, 1929), ÔMACHI (*Madasumma* 1926) and KORNHAUSER (*Thelia* 1919) have already studied on the subject. Among others PEARSON's investigation is very important in the recent research of morphology of chromosomes. He found as many as three different types of appearance of the gynandromorphic individual which are otherwise normal in cytological condition.

However, the frequency of the gynandromorphic individual is by no means great; it has been described to occur in the *Drosophila* once in one thousand individuals and in the Katydid once in five hundred individuals.

The material on which I proposed to work cytologically was fixed in the strong Flemming's solution, and cut into serial sections 10 μ in thickness. They were stained with HEIDENHAIN's iron haematoxylin.

In the ovo-testis dealt with, a mass of ovarian tissue is attached to a testis.

1) After CHENG (1929) and MAKINO (1931).

The diameter of the ovarian part measures about 800μ while the size of the testicular part is normal, that is about five times as large as the size of the ovarian part (Fig. 1). Both ovarian and testicular parts show apparently no aberrant structure except chromosomes.

The chromosome number of the normal male, as Prof. OGUMA has studied, is 23 (Fig 2), and all of the chromosomes have telomitic spindle fiber attachment, representing the so-called Hippiscus type after McCLUNG (1914). However, when I examined the chromosomes of the spermatogonium of this material, I found an astonishing fact that one is unable to account for without difficulty.

In the spermatogonium (Fig. 3, 4, 5), the chromosomes are found always 22 in number (even), instead of 23 as counted in the normal male. It suggests that the difference of the chromosome number in the spermatogonium is due to the linkage of some chromosomes which might be recognized by split or constriction of chromosome, as known already in many animals. But in the present material, so far as observed, there is no abnormal split or constriction which indicates the traces of the association of some chromosomes.

In the first spermatocyte, I found eleven tetrads of autosome and one dyad of sex-chromosome as found in the normal male, that is to say, it is to be analysed into twenty three univalent chromosomes as observed in the normal male. It is expected, therefore, that during the prophase of the first spermatocyte division, the increase of one univalent chromosome will take place, but there is so far no trace of such phenomenon as to prove increase of chromosome number.

In the second spermatocyte, two kinds of daughter cells are produced. These are the no-x-class and the x-class nuclei. In the former there are contained eleven autosomes and one sex-chromosome, while in the latter the sex-chromosome is missed. In both kinds of nuclei all chromosomes take the dyad-form.

The sperm formation is normal and the sperms fill the cysts, but in some cysts the spermatozoa degenerate and the epithelium of the cysts thickens slightly more than usual.

The ova found in the ovo-testis, have various sizes. They are all in the growth period and no ripe ovum is found (Fig. 1, 6). The largest follicle

measures $250\mu \times 120\mu$ in diameter and the smallest one $100\mu \times 46\mu$. By high magnification, I found in the ovum the cytoplasm which contains deutoplasmic granules, and a large vesicular nucleus (Fig. 7).

The nucleus contains a loosely arranged karyotin network and one nucleolus, in which some irregular karyotin granules are observed.

Many degenerating and degenerated ovarian follicles are observed beside a small number of young follicles (Fig. 6). In all the follicular epithelium of the ovo-testis, many cells are in the process of cell division, but they are flat in shape, instead of having reached the stage in which the cylindrical epithelial cells are found. Some of the follicles have degenerated already at this stage.

Briefly, in the ovo-testis found in a larval locust, the spermatogonia lack one chromosome. In spite of this fact, spermatogenesis is accomplished and ripe spermatozoa are produced abundantly. The development of the ovum, on the contrary, is retarded greatly as compared with the spermatogenesis and they are all seen degenerating.

It is a pleasure to acknowledge here my deep indebtedness to Prof. K. OGUMA by whose suggestion this work was undertaken and under whose helpful supervision it was finished.

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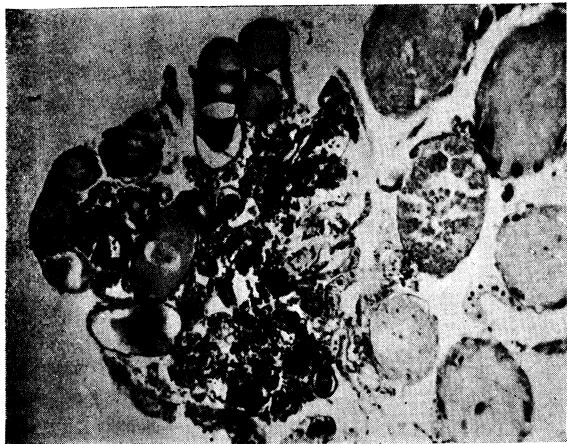
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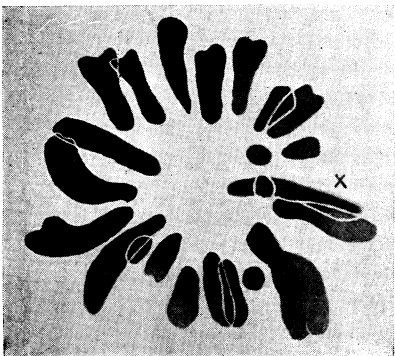
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Explanation of figures.

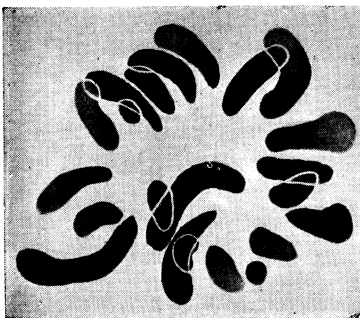
- Fig. 1. Showing the ovo-testis. The spermatozoa in the cysts and the largest vesicular follicle in which a nucleus with one nucleolus is located. Photomicrograph. ($\times 50$).
- Fig. 2. The metaphase of the spermatogonia in the normal individual. Showing the twenty two autosomes and one sex-chromosome. Drawing. ($\times 2500$).
- Fig. 3. The metaphase of the spermatogonia in the gynandromorphic individual. The same number of chromosomes as in Fig. 4, 5. Drawing. ($\times 2500$).
- Fig. 4, 5. The metaphase of the final spermatogonia in the gynandromorphic individual. The even chromosome number (22) and the slender forms as compared with those in Fig. 3 are shown. Drawing. ($\times 2500$).
- Fig. 6. A part of the ovary in the ovo-testis. cd, cell division of the follicular epithelial cell. yo, young ovum. df, degenerating follicle. nl, nucleolus. Photo. ($\times 150$).
- Fig. 7. A vesicular follicle. dg, deutoplasmic granule. fc, follicular epithelial cell. n, nucleus. y, yolk. cd, cell division of a follicular epithelial cell. nl, nucleolus. Photo. ($\times 550$).



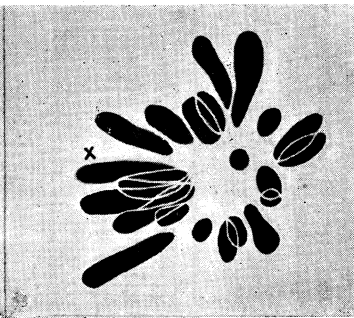
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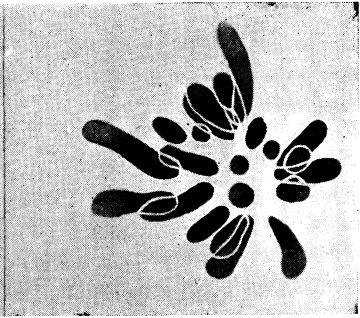
2



3



4



5

cd

nl n y



6

yo



7

df

nl

cd

dg

cd

fc

摘 要

アシマダラフキバツタ (*Podisma sapporoense* SHIRAKI) の
幼蟲に見出されたる *ovo-testis* に就て。

名 取 武 光

余は 1927 年、札幌近郊に於て普通に見られるアシマダラフキバツタの染色體の研究に従事した。其材料中に外觀は正常の雄であるにも係らず *ovo-testis* を有する個体を偶然發見した。元來雌雄同體の個体は極めて稀に發見されるもので果蠅では千個体中に一、蠶斯では五百個体中に一位の割合に存在すると報告されてゐる。

余の材料に於ける *ovo-testis* は普通大の *testis* に略 800 μ . の直徑を有する卵巢塊が附屬してゐるものである。之を細胞學的に觀察した所が精原細胞に於て染色體が一個不足してゐる事實を發見した。アシマダラフキバツタの精原細胞に於ては二十三個の染色體を見るべきであるにも係らず二十二個の偶數である。其中一個は性染色體で他は常染色體である。然るに精母細胞に於ては十二個の染色體を見この中一個は *dyad form* の性染色體で他の十一個は *tetrad form* の常染色體である。して見ると第一分裂の前期に於て *univalent* の染色體が一個増加されてゐる筈である。其處で想像される事は精原細胞の染色體の *linkage* である。然し余の觀察し得た範圍では此の現象を説明するに足る染色體の *split* 又は *constriction*. 等の痕跡を見出し得なかつた。又第一分裂の前期に於ても染色體の増加を證し得る様な現象を見ない。

斯の如く染色體の異常があるにも係らず精虫發生は、各分裂の中期の染色體の配列が多少不規則である外は何等差支なく遂行され *cyst* には成熟した精虫が充満してゐる。之に反し卵巢に於ける卵子の發育は精虫のそれに比し遙かに遅れ未だ成熟せる卵子を見ないのみならず既に形成された卵子も退化の運命を辿つてゐる様に觀察される。

(北海道帝國大學農學部動物學教室)