65. *Further Studies on the Chromosome Alterations by X-rays in Loxoblemmus arietulus.*

By Kazuo SUZUKI.

Botanical Institute, Faculty of Agriculture, Tokyo Imperial University.

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In recent years the chromosome alterations by X-rays have been studied by various investigators in animals as well as in plants, the results of which are now under discussion.

Concerning *Loxoblemmus arietulus* the writer¹⁾ has reported that the number as well as the shape of the chromosomes undergo the alteration through the action of X-rays.

This paper, which is a continuation of the previous studies is devoted to the description of another kind of the effect produced by the same influence.

Among the individuals of the present species, of which the writer²⁾ has reported the variation in the chromosome-number, the group C was used as the material of the experiment, Viz, 4 J's, 2 V's, 6 rods with one X, the total number being 13 (Fig. 1).

The larvae of the males were exposed to X-rays under the following conditions:—

Kilovolts	70
Mileampers.....	3.0
Distance from the target	30 c.m.
Aluminium filter	1 m.m.
Time	7 minutes

After the exposure both testes of the living insects were fixed with Flemming's weak solution; the sections were 10–12 micra thick, and stained with Heidenhain's iron-haematoxylin.

In the writer's previous observation, the alterations were observed on the larvae killed mostly three days after the treatment.

Fig. 1 represents a spermatogonium cell in which all the chromosomes are shown in their normal conditions. The nature of the chromosomes alteration induced by the treatment can be seen in Fig. 2–9. In Fig.

1) K. Suzuki: Preliminary Note on the Chromosome Alteration by X-rays in *Loxoblemmus arietulus*, a Species of Grylloid Family. Proc. 8 (1932), 521.

2) K. Suzuki: The Variation of Chromosome-Number in *Loxoblemmus arietulus*, a Species of Grylloid Family. Proc. 9 (1933), 330.

2 and 3, a very long rod-shaped chromosome A is seen, which has been apparently produced by the fusion of one detached piece of a V-shaped chromosome to the end of a rod-shaped one. Such an attachment of a fragment of one chromosome to another one leading to their complete fusion, was never observed by the writer in normal and unaffected chromosomes. The whole number of chromosomes remained the same as normal, i.e. 13, though that of V-chromosomes has changed. In Fig. 4, the number of rod-shaped chromosomes has multiplied to 11 instead of the normal number 6, some of which are those broken off from J-shaped chromosomes. Fig. 5, A shows the detachment of the rod-shaped chromosome, and the detached pieces are seen lying at the end of the original chromosome. Fig. 6, A shows the detachment of one arm of a V-chromosome close to the attachment of spindle fibers. Fig. 7, A shows the detachment of the middle part of one arm of the V-chromosome, and the detached pieces are seen lying at the end of the original chromosome.

Thus the chromosome number has multiplied in all these spermatogonia represented by Figs. 4-9 the largest number being seen in that of Fig. 8 where it is as many as 17. In Fig. 9, irregularly rod-shaped chromosome A and B are seen, while they are rather small but quite distinct.

As in the previous experiment, it will be seen that all these variations in number as well as in the shape of the chromosomes in our experiment are due to the alterations caused by the action of X-rays.

It will be not improbable that through all these changes of chromosomes, the shape of the insects might alter and lead to the mutation of the species, provided that such alteration are heritable.

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Explanation of figures.

All figures were drawn at the level of the desk on which the microscope was set with aid of Abbe's drawing apparatus, by using Zeiss objective $\frac{1}{12}$ m.m. and compensating ocular, K. 12, tube length, 17 m.m.

Fig. 1. Normal spermatogonium with 12 chromosomes plus one X.

Fig. 2-9. Spermatogonia treated with X-rays.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.