HOKKAIDO UNIVERSITY

Title	生殖細胞式の雌雄ニ型
Author(s)	田中, 義麿
Citation	札幌博物学会会報, 5(2), 61-64
Issue Date	1914-06-13
Doc URL	https://hdl.handle.net/2115/60886
Type	journal article
File Information	Vol.5No.2_001.pdf

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SEXUAL DIMORPHISM OF GAMETIC SERIES IN THE REDUPLICATION.

By

Y. TANAKA.

生殖細胞式の雌雄二型

田中義麿

In all instances of the reduplication hitherto investigated by various authors it was assumed if not proved, with exception of a few disputed cases,[1] that the gametic series follow an identical system, so far as the characters are not sex-limited, in the male and female. My experiments with silkworms, however, furnish a positive evidence for possibility of dissimilar distribution of gametes among the opposite sexes, i.e. sexual dimorphism of gametic series. Such was the case with the reduplication between the yellow cocoon colour and one of the larval markings such as the normal, moricaud, and striped.

In these examples the reduplication in male gametes is a partial reduplication of low intensity, while the reduplication is complete in female. They may be graphically expressed as follows:

	AB		**Ab**		**aB**		**ab**
Coupling	n	:	1	:	1	:	n
	1	:	0	:	0	:	1
Repulsion	1	:	n	:	n	:	1
	0	:	1	:	1	:	0

Where

n = 2 or 3.

A=Epistatic marking　　**a**=Hypostatic marking

B=Yellow colour　　**b**=White colour.

Two categories of the reduplication will conveniently be dealt with under distinct sections.

1) Those of Gregory (Jour. Gen. Vol. I. No. 2.) and Saunders (Jour. Gen. Vol. I. No. 1 and 4).

Gametic Repulsion.

The case in which more sufficient data have been obtained up to the present is that of the normal-yellow repulsion. Relating to the reduplication under consideration, over 70 families involving more than 20,000 individuals were reared, certain families of them being carried up to F_4 generation. The heterozygotes (**AaBb**) were, in the course of experiments, also crossed with the double recessives (**aabb**) reciprocally. The gametic series thus revealed were

	AB		**Ab**		**aB**		**ab**
♂	1	:	2	:	2	:	1
	1	:	3	:	3	:	1
♀			1	:	1		

The recombination of these gametic forms will result in the zygotic series

A-B-		**A-b-**		**a-B-**		**a-b-**
2	:	1	:	1	:	0

So far as the experiments have been carried on up to F_2 in the straight direction, the case is hardly distinguishable from an ordinary case of complete repulsion that occurs alike on both sexes. In the present case, however, F_2 **A-B-** form is not even in its zygotic constitution but is composed of various biotypes which may give the offspring in various combinations of F_3 forms—i.e. the resulting F_3 families can be grouped into four classes as follows :

Class (a) involving 3 zygotic forms, **A-B-**, **A-b-**, **a-B-** ;
„ (b) „ 2 „ , **A-B-**, **A-b-** ;
„ (c) „ 2 „ , **A-B-**, a-B- ;
„ (d) „ only **A-B-** form.

F_2 **A-b-** and **a-B-** individuals are each composed of two groups, one breeding true to their parents, while the other producing **aabb** animals in addition to those of the parental type.

All this is beyond explanation if the ordinary complete repulsion be supposed as the case, but it can easily be accounted for if the gametic series above given was assumed. More positive evidence for such dimorphism of gametic series has been actually obtained from the crosses between the heterozygote and the double recessive.

GAMETIC COUPLING.

Somewhat fully studied cases in the field of the coupling-reduplication are the moricaud-yellow and the striped-yellow coupling. In these the gametic series are

	AB		**Ab**		**aB**		**ab**
♂	2	:	1	:	1	:	2
♂	3	:	1	:	1	:	3
♀	1			:			1

If the male series is 2 : 1 : 1 : 2, the F_2 zygotic series will be 8 : 1 : 1 : 2, and if the 3 : 1 : 1 : 3 is the case with male gametes, the F_2 ratio will be 11 : 1 : 1 : 3. So far as the breeding is confined to themselves the actual feature of the gametic distribution under consideration will not be revealed because the ratios 8 : 1 : 1 : 2 and 11 : 1 : 1 : 3 are not practically remote from the zygotic series which would be produced by the ordinary 4 : 1 : 1 : 4[1] and 7 : 1 : 1 : 7[2] systems respectively. The clear analysis of the case was accomplished by crossing the diheterozygous animals with the double recessives reciprocally.

THE 9 : 3 : 3 : 1 RATIO DERIVED FROM THE REDUPLICATED GAMETIC SERIES.

The reduplicated gametic series do not necessarily give rise to an abnormal zygotic distribution, but the apparently normal 9 : 3 : 3 : 1 ratio may sometimes be produced by them.

In the cross **Aabb** ♀ × **AaBb** ♂, where the female produces two forms of gametes while the male gives four possible gametic combinations, the **AaBb** form in the subsequent generation may be produced by union of the gametes **ab** and **AB** as well as by that of **Ab** and **aB**. In the **AaBb** *female* which resulted from fertilization of **ab**-egg by **AB**-sperm there will occur, as stated in the preceding lines, a complete coupling between **A** and **B**; in the **AaBb** *male* derived from fertilization of **Ab**-egg by **aB**-sperm, on the other hand, there will exist a low partial repulsion, say 1 : 3 : 3 : 1. If in interbreeding of the **A-B-** offspring ex **Aabb** ♀ × **AaBb** ♂, the male and the female such as above mentioned chanced to be brought to mating, that is, if the gametic series in the couple were

1) The resulting zygotic series is 66 : 9 : 9 : 16 that is 7.33 : 1 : 1 : 1.78.
2) The resulting zygotic series is 177 : 15 : 15 : 49 that is 11.80 : 1 : 1 : 3.27.

	AB	**Ab**	**aB**	**ab**
♀	1	:		1
♂	1	: 3	: 3	: 1

the resulting zygotic series will be the normal ratio 9 **A-B-** : 3 **A-b-** : 3 **a-B-** 1 **a-b-**.[1)]

A similar result may be obtained by mating F_1 females ex **AABB** × **aabb** to F_1 males ex **AAbb** × **aaBB.**

The actual figures and other details of my experiments concerning the subjects dealt with in the present work will be described in separate papers.

College of Agriculture,
Tohoku Imperial University,
Sapporo.

1) Such result will not be obtained from the reciprocal cross, **AaBb** ♀ × **Aabb** ♂. As the complete reduplication occurs in the **AaBb** female, the offspring of such cross will be 2 **A-B-** : 1 **Aabb** : 1 **aabb** or 1 **AaBb** : 2 **A-b-** : 1 **aaBb** according to whether **A** and **B** were carried in by the same parent in the original cross or they were brought together by different parents.

摘　　要

遺傳質の結合式は伴性遺傳及び二三の異論有る例外を除けば從來一般に生物の雌雄兩性に於て全く相等しと考へられたり。　然れども予が蠶の遺傳に關する研究の結果に依れば其のカップリング及びレパルションの場合に於ては雌雄の生殖細胞式が劃然相異りたる方式に屬するを知れり。　即ち雄に在りては甚だ低度の部分的レヂユープリケーションにして雌に在りては完全なるレヂユープリケーションなり。

此の事實は普通行はるゝ如く直系的に相互交配を爲すのみにては其眞相を闡明すること難しと雖、兩質雜種の個體を絕對劣性の個體と交配する時は容易に之を確證し得べし。

本題に關する實驗成績の詳細は遠からず發表せんとする二論文に於て記述すべし。