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A SEX-LINKED TRANSLUCENT GENE WHICH OCCURRED INDEPENDENTLY IN THREE DIFFERENT STRAINS OF THE SILKWORM[1]

Yoshimaro TANAKA

I have observed silkworm larvae with translucent skin due to a single recessive gene *os*, an allelomorph to the normal gene *Os*, in three unrelated strains. They are described in the present paper.

I. *GIALLO-PURO* TRANSLUCENT

In 1916, I discovered translucent larvae in F_1 generation of a cross between Japanese bivoltine *Okusa* and Italian univoltine *Giallo puro indigeno*, the translucent character of which was sex-linked in inheritance, and the symbol *os* was adopted for that gene. Later I found *os*-translucent in the pure breed of *Giallo puro*, but never in pure *Okusa*, hence it is certain that the *os* gene was brought in our *Giallo puro* breed. The pedigree of the pure *os*-strain which we are keeping up to the present is given below.

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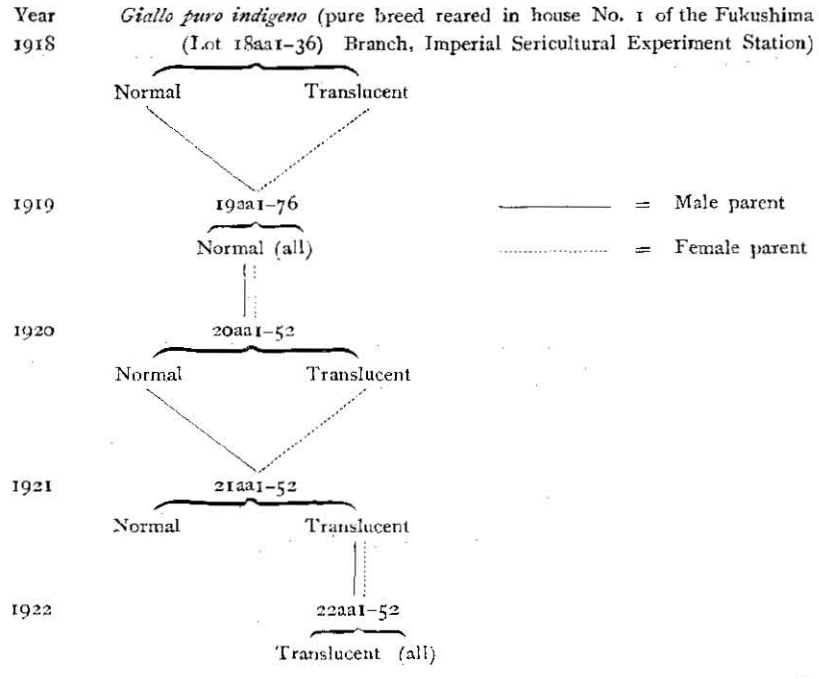
1 Contributions from the Sericultural Laboratory, Kyushu Imperial University, No. 8.



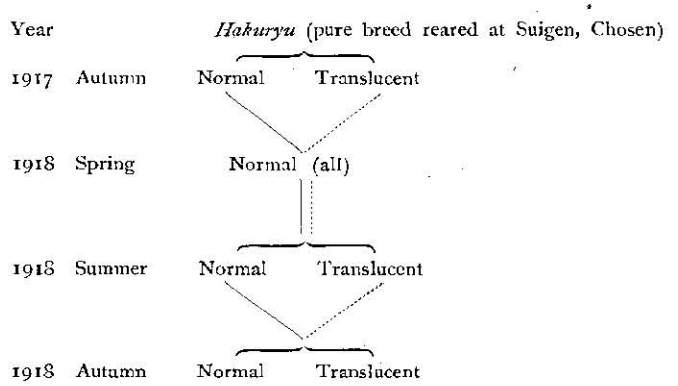
The sex-linked translucents from *Giallo puro* are homozygous for blood and cocoon colors (yellow), voltinism (univoltine) and molting character (4-molters, i. e. they pass through four molts before spinning cocoons). But they are considerably variable in marking intensity, showing every grade from no-marking (plain) to moderately dark normal marking. More detailed descriptions of this strain are to be found in my previous papers (TANAKA 1917, 1922).

II. *HAKURYU* TRANSLUCENT

H. NISHIKAWA, geneticist in the Sericultural Experiment Station, Suigen, Chosen (=Korea), has reported another strain of sex-linked translucents from a pure Japanese breed *Hakuryu* (NISHIKAWA 1918, 1922). This race was homozygous bivoltine, white-blooded, normal or quail-marked, 4-moulters.

Through the kindness of Mr. NISHIKAWA, I received the eggs of *Hakuryu* translucent in exchange for those of my *Giallo puro* strain. I crossed the two under consideration and obtained only translucent F_1 larvae, proving that *Hakuryu* translucent is due to the same gene as

Giallo puro translucent. According to Mr. NISHIKAWA, his strain originated from two translucent larvae (both female) discovered in the autumnal culture 1917 in a pure breed of *Hakuryu* and crossed with their normal opaque brothers. The pedigree is as follows:

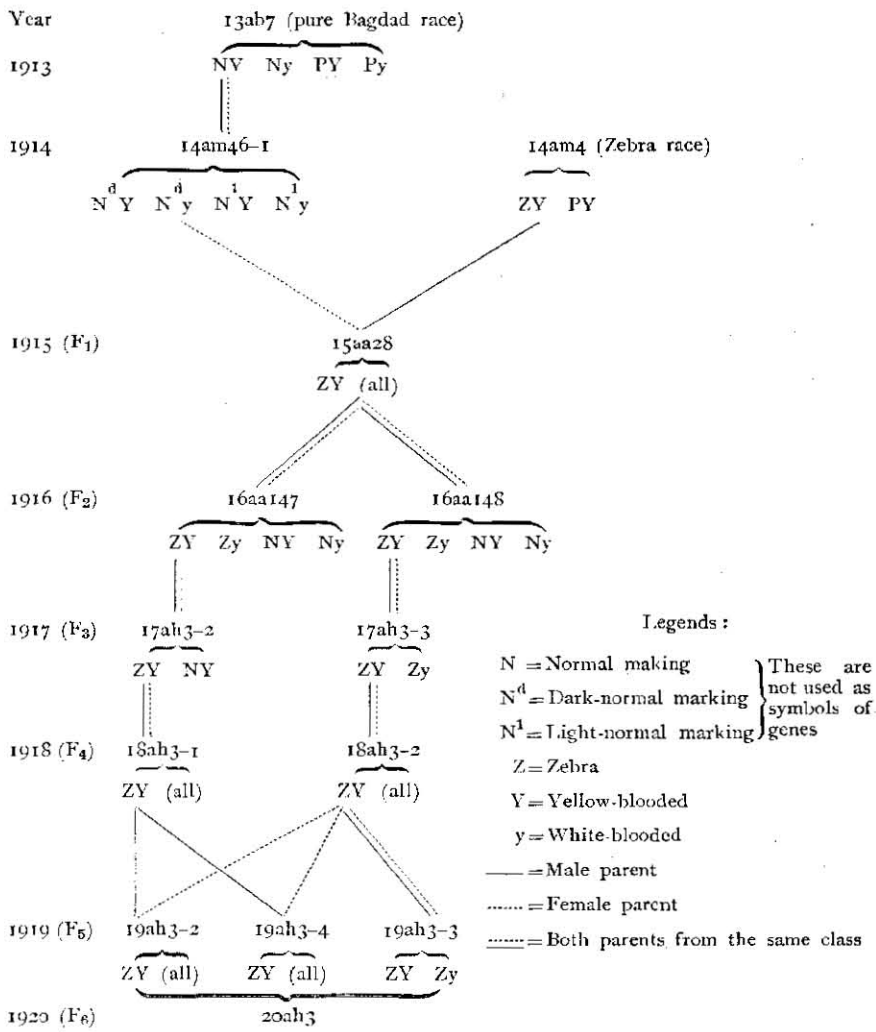


No blood relationship could be suspected between *Giallo puro* and *Hakuryu* reared thousands miles apart, and they differed in so many characteristics from each other that contamination, if any, ought to be detected at once.

III. *H3* TRANSLUCENT

Besides the two cases mentioned above, I obtained a third sex-linked translucent strain from a cross between *Bagdad* (European univoltine) and "zebra" (Chinese univoltine). F_1 generation was cultivated in 1914, and the subsequent generations, mated among themselves, were reared and subjected to careful observations without giving rise to any translucent caterpillar up to and including F_5.

In F_6 1920, there suddenly appeared 26 translucent females in this strain, lot 20ah3, whose pedigree is shown below.



The segregation in lot 20ah3 was as follows :

	Opaque (normal)		Translucent.		Totals
	♀	♂	♀	♂	
Zebra, yellow-blooded	178	292	19	0	489
Zebra, white-blooded	58	77	7	0	142
Totals	236	369	26	0	631

This lot was a mixed culture of larvae from 21 batches, and consequently the proportion of translucent to opaque has little significance. Nevertheless the extremely small number of translucents in this lot could be taken to suggest that the translucent larvae appeared in only one or at most a few of the batches reared.

I have bred a new translucent strain from the offspring of translucent females mentioned above by mating them to normal brothers. Crossing was made between this translucent strain and that of *Giallo puro* as well as that of *Hakuryu*. The offspring were all translucent in either cross, i. e. the *h3*–translucent was also due to *os* gene as in the case of the other two strains.

Although we had already *Giallo puro* translucent in our possession when *h3*-translucent females made their first appearance, no contamination was likely to occur between them. If mating had taken place between *h3*-opaque females and *Giallo puro* translucent males in F_5, 1919, it would have resulted in segregation of opaque males and translucent females in the next generation, 1920, giving no translucent males as was actually the case. But if this generation were produced in such a way it ought to have consisted of yellow-blooded larvae only, because the *Giallo puro* race was homozygous yellow, whereas the actual result was contrary to this expectation; we had both yellow and white blooded larvae in translucent type as well as in opaque.

No other way of contamination which might give rise to translucent females but no translucent males, could be imagined. Suppose, for example, contamination had occurred between still more remote ancestors, say between translucent females (*Giallo*) and opaque (*h3*) males in F_4. In that case the normal marking or plain character of *Giallo* must have segregated in F_6. But this was not actually the case.

IV. SUMMARY

The sex-linked translucent gene *os* has occurred independently in three different races of silkworm, *Giallo puro*, *Hakuryu* and *h3*. The first two were pure races, while the last one was a hybrid strain. This is an example of parallel mutation in the silkworm.

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