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〈特講要旨〉

A Consideration on a Mode of Inheritance of Feeding Behaviour to Artificial Diets in Silkworm, *Bombyx mori* L.

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Although the domesticated silkworm, *Bombyx mori* L. is generally regarded as a phytophagous and/or monophagous insect which feeds only mulberry leaves, a number of sericulturists has long been attempted to obtain some mutant lines, which can feed various plant leaves other than the mulberry leaves. In fact Tazima and his colleagues obtained such a non-preferential mutant lines (Np) from about 100,000 larvae of X-rayed certain commercial stocks, but the radiation-induced mutant larvae can not survive or further develop when they are continuously fed with common beet leaves, *Beta vulgaris Var. Cicla* (Tazima, 1954 : Tazima *et al.*, 1984). Yokoyama (1972) also with a success obtained a mutant line (Sawa J) through persistent selection from the large population of Japanese strains. This spontaneous mutant line shows a wide feeding response to various plant leaves (cabbage and even some fruits including apple, banana, kaki, etc.).

Furthermore, the mutant showed a positive feeding response to the artificial diet containing a high percentage (20%) of powdery mulberry leaves and even on the semi-synthetic diet without the powdery mulberry leaves. In addition, the larvae of Sawa J line can be reared with the artificial diet throughout the whole larval period and finally they can make cocoons.

According to genetic analysis on the feeding behaviour of the Sawa J line, it was revealed that there were genetic factor (s) responsible for polyphagocity and it was dominant as to the semi-synthetic diet (Fujimori *et al.*, 1982) but on the other hand there was a report illustrating that a recessive gene (s) may be involved in as to the artificial diet (or LP-1) (Kanda *et al.*, 1988).

This contradiction seemed to be obviously attribute to a different constituency of the diets and/or silkwom varieties used for the experiments; presence of the powdery mulberry leaves in diets and the varietal difference with a difference feeding response to the diets (Kansen and Sawa J stains).

Regarding the gene behaviour responsible for feeding response to diet, Sawa J is dominant over Kansen (Kanda *et al.*, 1988). This contradiction is clearly due to a constituency of the diets used for the experiments.

Furthermore it is also certain that the contradiction for the genetic nature of Sawa J is exclusively attributable to the hypothesis that the feeding behaviour is under control of single major gene or a couple of modified genes.

The feeding behaviour of the insect is generally concerned in a number of factors; olfaction, gustation, and other senses. In fact there is no markedly differences in physical properties of the two types of diets used for the experiments except the presence of the powdery mulberry leaves, supposed that the olfaction and gustation are main factors involved in the feeding behaviour.

However, it can not be completely excluded that some physical factors responsible for a tactile sense to the diet is also involved under certain circumtances.

Newly hatched F_1 larvae obtained from a mating between Sawa J (S) and Kansen (K) stocks well fed on artificial diet and about 68% of the BF_1 larvae

Table 1. *The feeding response to the different constituents of diet with the different strains and their combinations*

Strains and their combinations	Assummed genotypes			Mortality	
				Diet (22% leaf powder)	Artificial diet (LP-1)
Sawa J	o+T	-	-	99.9 (%)	89.3 (%)
Chinese (C) race	-	-	0++t+	15.9	0.0
(Sawa J×C) F_1	-	o+T-/0++t+	-	98.5-99.2	0.0
(C×Sawa J) F_1					
(Sawa J×C)×C	-	o+T-/0++t+	0++t+	67.8	0.0
(Sawa J×C)×Sawa J	o+T-	o+T-/0++t+	-	99.3	32.0
(Sawa J×C) F_2	o+T-	2[o+T-/0++t+]	0++t+	86.2	7.7

1) Fujimori *et al.*, (1982) : Kansen was used as a chinese race.
2) Kanda *et al.* (1988) : Chinese No.2, as a Chineses race, was used.

(S×K)×K fed on the diet (Fujimori *et al.*, 1982), while the F_1 and BF_1 larvae (S×C)×C from a cross, Sawa J and Chinese No.2 did not feed on the artificial diet (LP-1) (Kanda *et al.*, 1988).

From the above-mentioned contexts, it is very likely to assume that Sawa J larvae have a non-preference for the artificial diet as well as for the mulberry leaves due to a highly dull sense of the olfaction and gustation and that a genetic factor responsible for the dull sense for smell is recessive (o -) and for the gustation is dominant (G -), whereas the Chinese No.2 is particular fastidious about the artificial diet on account of a keen sense for the smell (O) and taste recessive (G) and by Kanda *et al.*, (1988), it is also possible to imply a recessive-dominant relation as to the genetic factors (olfaction and taste senses) repoisible for the diet preferennce in each stock as follows : the Chinese stock in question have a dominant character with a strong reaction for the olfaction sense (O), but a recessive character with a sharp reaction for the taste sense (g), whereas the Sawa J line has a recessive character with a dull reaction (O), as compared with that of the Chinese stock for the olfation sense and a dominant but dull character (G) for the taste sense.

These static relation in the feeding behaviour proposed for the three stocks to the artificial diet can consistently interprete the observations of the BF_1 and F_2 generation (see also Table 1). By the way, a diet preferential activity among the various geographical races in *Bombyx mori* L. is remarkable; Japanese race has a wide spectrum for the feeding response to the artificial diet regardless of the presence of the powdery mulberry leaves in the diet, while Chinese race is a particular preference about the constituency of diet and that is distaste for the artificial diet.

In addition, for European race, the diet preference seemingly dependent upon the stock to stock. The racial difference of preference to the diet will throw light on the differentiation of the insect species as well as the transmission route of the Japanese race.

In sum up, the genetic factors, in relation to the feeding response to the diet, the olfaction and the gustation for the above-discussed three lines can be designated as follows : Sawa J line seems to have a recessive gene (s) for a dull olfaction sense and dominant gene (s) for gustation while the two Chinese stocks have a dominant factor for the olfaction sense and recessive gene (s) for the gustation.

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