

BRIEFER ARTICLES

IS FASCIATED A FREQUENTLY MUTATING CHARACTER?

The fasciation of *Pharbitis nil*, the Japanese morning glory, is manifested by certain polymeric genes. The writer¹ has already described three genes, fasciated-1, fasciated-2, and fasciated-3. Owing to the reduplicated nature of the genes on the one hand, and the possible existence of modifiers on the other, the segregating proportions of fasciated to normal are often complicated and deviate from the expectations. Some genotypically fasciated species have uncertain manifestations of fasciation; in other words, the fasciated pedigrees frequently give some normal atavists among their progeny, sometimes containing even a majority of normals. HAGIWARA² regarded them as produced by gene mutation. On selfing 5 fasciated plants obtained in hybrid progeny, he got 119 individuals containing 41 atavists.³ He also called attention to the occurrence of reverse mutations from normal to fasciated. This possibility, however, is based on rather unconvincing facts. Of course, our fasciated species originated spontaneously from normal ancestors, and this origin would surely be due to mutation. This mutation, however, seems to be very rare. As to the occurrence of normal atavists among fasciated sisters, YAMAGUCHI⁴ also reported as follows:

Was zunächst das oftmalige Auftreten der Atavisten (Rückmutanten) in den verschiedenen Linien mit fasziiertem Stengel anbetrifft, so scheinen mir darunter zwei Kategorien unterschieden werden zu sollen. Die Atavisten, die nach der Selbstbefruchtung ausschliesslich fasziierte Nachkommen geben, wie ich bisher beweisen konnte, sollten der einen Kategorie angehören, während sie

¹ IMAI, Y., Experiments with a pear-leafed and fasciated strain of the Japanese morning glory. *Jour. Genetics* 18:275-314. 1927.

² HAGIWARA, T., Genetic studies of the fasciation in morning glories. *Bot. Mag. Tokyo* 40:281-294. 1926 (Japanese).

³ Most of them were noted as having non-pear leaves among otherwise pear leaves. To the writer, such non-pear and non-fasciated plants would have suggested contamination rather than double mutation.

⁴ YAMAGUCHI, Y., Notiz über die Vererbung der Fasziation bei *Pharbitis nil*. *Bot. Mag. Tokyo* 40:535-537. 1926.

sich bei der anderen wieder in die ihr ähnlichen normalen und fasziierten zu spalten pflegen. Die erste Kategorie könnte man etwa falsche Atavisten (Pseudo-Rückmutanten bzw.-Rückmutation) nennen, während es sich bei der zweiten um die echten Atavisten, d.h. um die Rückmutation des Gens handelt.

In other words, YAMAGUCHI accepted HAGIWARA'S view that fasciated is a frequently mutating character, but at the same time he recognized its fluctuation resulting in a normal character. YAMAGUCHI'S paper being in the nature of a short note, he did not give numerical data supporting his view.

The writer, however, concluded that these normal atavists are due merely to fluctuation in manifestation of the character fasciated. His evidence was furnished by the hybrid progeny derived from a cross between non-fasciated no. 326 and fasciated no. A5. An F_3 examination of this cross covers progenies of 183 F_2 plants, of which 35 are pear and non-fasciated and 5 are pear and fasciated. Of these 35 pear and non-fasciated F_2 plants, two proved, on examination of their offspring, to be really pear and fasciated; that is, they were false normals. Combining these results with those of properly fasciated plants, the data contain 65 individuals, of which 6 are normal atavists. When the previous paper was written, these were all the data available to support the writer's opinion that atavists are due merely to the fluctuating manifestation of the character fasciated. In the successive years two further generations of fasciated F_3 plants have been raised to prove this view and settle the problem.

On selfing two fasciated F_3 plants of pedigree no. 169, of which the F_2 mother plant was a false normal (atavist), the writer obtained F_4 offspring consisting of 16 fasciated and 10 normal plants and 33 fasciated and 9 normal plants respectively. From the former pedigree an F_5 generation was reared. The F_5 offspring of 16 fasciated F_4 consisted of 162 fasciated and 42 normal plants, and those of 9 normal F_4 contained 66 fasciated and 17 normal plants. The proportions of normal atavists in these pedigrees are 21 per cent in the former and 20 per cent in the latter, giving practically the same results. These data collectively do not furnish anything for the mutation view, but give indisputable evidence for the fluctuation view. The genes for fasciated, therefore, are of constant state, and the frequent appearance of normal atavists among fasciated sisters is due to a fluctuating representation. These atavists are of a temporary form. Returning to HAGIWARA'S data, they do not give any positive evidence for his mutation view. For YAMAGUCHI'S view we cannot argue beyond his statement, because he did not present numerical data.

The proportion of false normals among fasciated sisters is very variable, owing partly to various genotypes of the fasciated complex and partly to the fluctuating manifestation of the fasciated character. One of the writer's fasciated strains, no. A5, is very fixed for the representation of the characteristic and contains almost no atavists. YAMAGUCHI⁵ stated that his fasciated strains were also highly fixed for this character. In his extensive cultivation⁶ of these pedigrees he obtained only 1 per cent of normal atavists among some 1200 or 1300. Another of the writer's fasciated strains gives about 15 per cent of false normals, although the proportion varies to some extent in the different cultures. The fasciated pedigrees obtained in the hybrid progeny are generally more unstable, through the interference of certain modifiers. The commercial strains, however, are generally of high fixation for the fasciated characteristic, because some intense selection would have been made before their registration.—Y. IMAI, *Botanical Institute, Agricultural College, Tokyo Imperial University*.

⁵ YAMAGUCHI, Y., On the inheritance of fasciation in *Pharbitis nil*. Proc. Jap. Assn. Adv. Sci. 2:264-273. 1926 (Japanese).

⁶ Owing to the defective sexual organs fasciated strains generally give few seeds.