

SHORT COMMUNICATION

GENETIC STUDY OF ONE-WINGED FLIES IN THE Va/Ba BALANCED STRAIN OF *Drosophila subobscura*

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ABSTRACT

Some flies from the balanced lethal strain Va/Ba of *Drosophila subobscura* are found to lack one wing. The absent wing is substituted by a bulky structure with a thoracic appearance which presents both micro- and macrochaetes. This trait could be a homeotic transformation. A preliminary study on the inheritance of this trait has been done. The results presented here suggest a recessive hereditary pattern, involving at least three genes.

The balanced lethal strain Va/Ba, the only one existing in *Drosophila subobscura*, was developed in order to obtain the O chromosomes of this species in homozygous condition (Sperlich *et al.*, 1977). This strain carries the dominant gene Va (Varicose: irregular thickenings at the junctions of the wing veins and short irregular side branches to the veins. It is lethal in homozygous condition) and the recessives ch (cherry: bright red eye color) and cu (curled: wings curled concave upwards) in one of its O chromosomes. In addition to these morphological markers, this chromosome carries two X-ray induced overlapping inversions (VIII+210) and two natural overlapping inversions (3+4). The other O chromosome of the strain has a standard arrangement and carries the dominant gene Ba (Bare: the number of macrochaetes (and occasionally microchaetes)

is variably reduced, but the bristle sockets are present. It is lethal in homozygous condition).

The mating scheme necessary to obtain the O chromosomes in homozygous condition has been previously described (Mestres *et al.*, 1990). In several chromosomal lines of the F₃ generation of these crosses, a variable number of heterozygous Va/+ individuals were found to lack one wing (Mestres and Busquets, 1991). This trait was detected in a similar proportion of chromosomal lines in two different populations. In a study of Bordil's population (100 Km N E from Barcelona, Spain) individuals with only one wing were detected in six of the 142 lines analyzed. In the other population, Gilroy (100 Km S E from San Francisco, USA), it appeared in eight of 195 lines analyzed. This similarity of proportions may mean that this trait is due to factors originally located in the Va/Ba strain (Mestres and Busquets, 1991), as a single wing has also been found in flies of the Va/Ba strain.

The absent wing is substituted by a bulky structure with thoracic appearance which presents a variable number of both macrochaetes and microchaetes. The same fly is presented in both photographs (Figures 1a and 1b), a heterozygous Va/+ female from the F₃.

This abnormality was detected in both sexes. The absent wing can be the left or the right, in a similar proportion: in a sample of 10 one-winged individuals, the left was absent in four of them.

In order to carry out a preliminary study of the possible inheritance of the trait many genetic crosses were performed. Only individuals of the balanced lethal strain Va/Ba were used in the crosses. Two virgin females with only one wing were crossed with males with two wings. The resulting generation (F₁) was phenotypically normal. F₁ individuals were then inter-crossed in 11 individual vials, in each case one male and one female, as different replicas. The results of the second generation (F₂) are presented in Table I.

The lack of individuals with only one wing in the F₁ and the recurrence of abnormality in F₂ suggests a recessive hereditary pattern. In the 11 replicas, the mean proportion of one-winged individuals in F₂ was 0.0148. If the model of inheritance were due to a trihybridism pattern, the expected value would be 0.0156, which is very similar to that obtained in the present experiment ($\chi^2 = 0.027$; 1 d.f.; $p > 0.9$).

This trait could be a homeotic transformation since one differentiated structure (the wing) is replaced by another (a bulky thoracic structure). In *D. subobscura*, as in other species of *Drosophila*, many homeotic transformations have been described. A well-studied example is the extra sex comb anomaly in the hybrids between *D. subobscura* and *D. madeirensis*. It seems that these two species have diverged at a minimum of four autosomal loci affecting this trait (Papacit *et al.*, 1991). Thus, the trait of absence of one wing may be controlled by at least three genes.

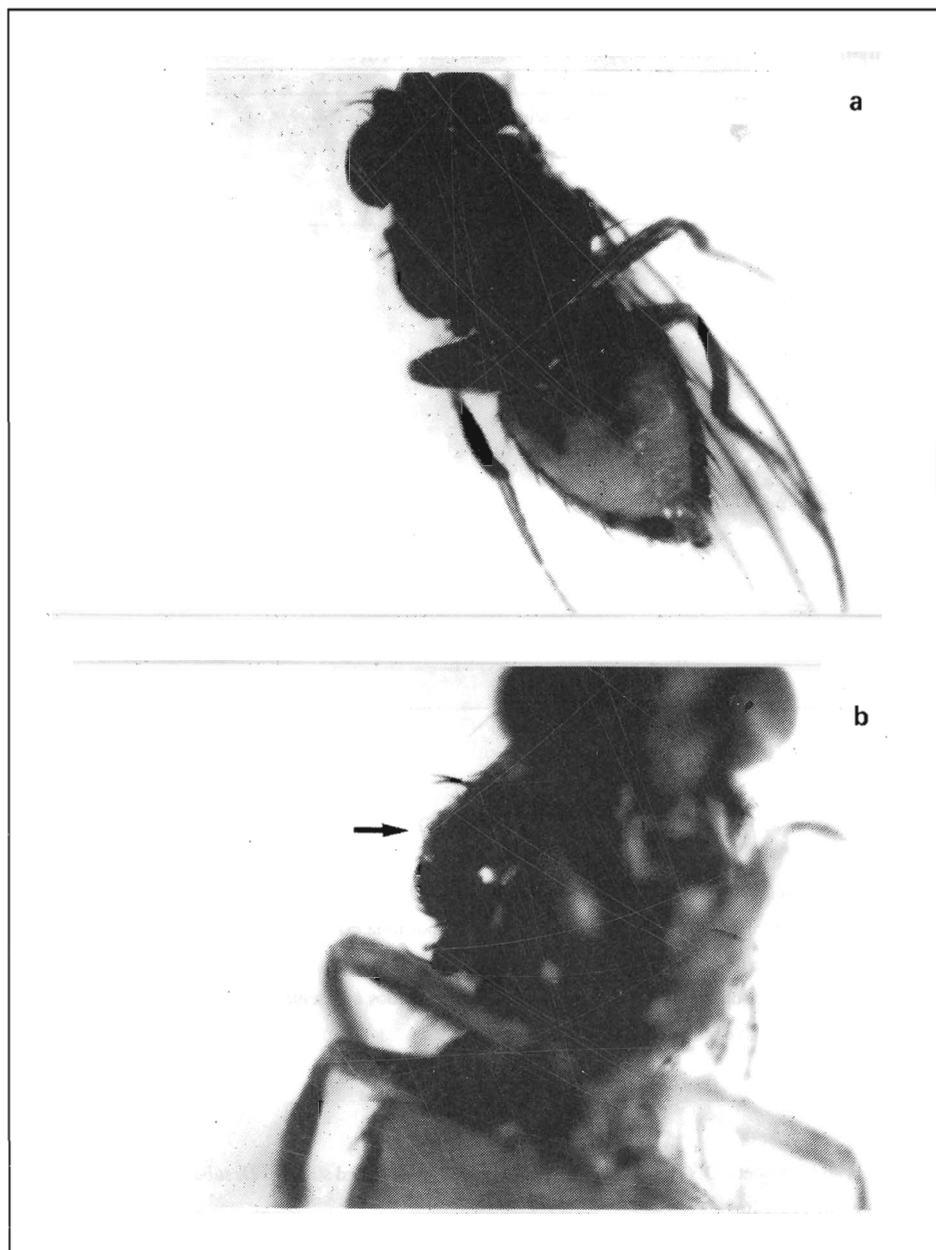


Figure 1 - Heterozygous $Va/+$ female with only one wing detected in the F_3 of the crosses performed to obtain O chromosomes in homozygous condition. In a, the phenotype of only one wing is clearly shown. In b, the bulky structure with thoracic appearance is presented (see arrow).

Table I - F₂ of the eleven independent crosses (replicas) performed between individuals of the F₁, resulting from virgin one-winged Va/Ba crossed with two-winged male Va/Ba.

	Only one wing		Normal	
	♀♀	♂♂	♀♀	♂♂
1	3	-	45	47
2	3	-	16	24
3	-	-	12	13
4	-	-	26	15
5	2	-	34	35
6	-	-	36	29
7	-	-	38	52
8	-	1	36	34
9	-	-	6	6
10	1	-	49	73
11	-	-	17	21
Total	9	1	315	349

RESUMO

Nas cepas Va/Ba, de letais equilibrados de *Drosophila subobscura*, aparecem algumas moscas que apresentam somente uma asa. A asa ausente é substituída por uma estrutura volumosa de aparência torácica que apresenta micro e macroquetas. Esta característica poderia ser uma substituição homeótica. Foi realizado um estudo preliminar sobre a herança deste carácter. Os resultados apresentados aqui sugerem um padrão de hereditariedade recessivo, envolvendo no máximo três genes.

REFERENCES

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(Received June 23, 1992)