Matsudaira, Y. and T. Yamasaki. Rikkyo University, Tokyo, Japan. Two types of lethal mutation induced by soft X-ray in D. melanogaster.

The fractional-lethal mutation, the so-called gonadal mosaic, has often been misclassified as a deleterious mutation in the case to examine the viability by using the Muller-5 method. Because, in F_2 generation, only males having the X chromosome derived from the lethal free fraction in the gonad of an F_1 fractional-lethal carrying female can emerge as adults; and as a result, the relative viability of the wild type males seems to be lowered. In such a case, the relative viability may be expected to be 1/2 on the average. In order to obtain the extent of the above mentioned misclassification, the following experiment was carried out. That is, adult males of D. melanogaster from Oregon-R stock were irradiated with 500R of Cu-K_α X-rays, and mated to virgin females from Muller-5 strain for 3 days. In the F_1 generation, pair mating was carried out from these cultures. In the F_2, the relative viabilities of the treated chromosomes were examined and whole- (complete) lethal mutations were detected (F_2 test). For some of the F_1 lines, 20 pairs of F_2 were isolated, and their offspring were tested for fractional-lethal (gonadal mosaic) mutation (F_3 test).

In the F_2 test, 1815 of the treated chromosomes were checked. Fifteen of complete lethals and 45 of low viable lines were found. For the F_3 test, 15 of the lethal lines, 38 of the low viable lines in their phenotypes (viability $\leq$ 50%), and 62 of the normal lines in their phenotypes (viability $\simeq$ 100%) were sampled. In the F_3 test, from the deleterious and the normal lines, 6 and 3 cases of the lethal containing lines, respectively, were observed (Table). In the table, the sizes of their lethal fraction, in other words, the transmissibilities of fractionals, are expressed by the number of vials of lethal exception over the number of vials examined for the lines in which were found lethals in F_3. As expected, for the fractional-lethals the deleterious appearance lines transmit the lethalities much more than the normal appearance lines, that is, 0.34 and 0.06. In the latter, the spontaneous whole-lethal mutations occurring in F_2 gonads may be included because, in these cases, only one of all the sampled vials shows lethal. If in these cases, the spontaneous mutations were not included, the induced frequency of the fractional-lethal mutation should be unreasonably high. (The frequency of fractionals assumed from the present data is given by, (6/38 x 45 + 3/62 x 1755) ÷ 1815 x 100=5.0(%).) We found that in this dose, the frequency of the fractional-lethal is 1.2% (1968, unpubl.).

For most of the deleterious appearance lines, the spontaneous mutation is never included in the observed value of the frequency of fractionals because several vials of lethal exception were found in a line. Accordingly, the value of 16%(=6/38) should be reliable as the frequency of the fractional-lethal mutation included in the deleterious appearance mutants induced by soft X-ray at 500R.

Table: Frequency and transmissibility of fractional-lethal (F_3 test)

	No. of examined chromosomes	No. of examined vials	No. of vials examined for the lines in which lethals were found in F_3	No. of lethal chromosomes	No. of vials of lethal exception	Transmissibility	Frequency of lethal chromosomes
Lethal phenotype in F_2	15	196	196	15	196	196/196=1.00	15/15=1.00
Deleterious phenotype in F_2	38	501	64	6	22	22/ 64=0.34	6/38=0.16
Normal phenotype in F_2	62	1073	47	3	3	3/ 47=0.06	3/62=0.05
Total of non-lethal lines	100	1574	111	9	25	25/111=0.23	