# THE EFFECT OF X RAYS ON ROOT MERISTEM OF BROAD BEAN *(VICIA FABA)*

## II. VARIATION OF MICRONUCLEI NUMBER AFTER IRRADIATION

BY

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**The number of micronuclei within the root meristem cells of broad bean (*Vicia faba* var. *minor)* was counted at 24 and 48 hours after irradiation. The plant material, seedlings of 5 days, was irradiated with X rays in the following doses : 50, 100, 150, 200, 300 and 500 R. The results show a good correlation between the applied doses and the increased number of micronuclei. Concerning the relationship between the DNA content and the number of micronuclei there is a good correlation only in a particular case, covering the range of 50 — 200 R doses.**

Evans, Neary and Williamson [3] observed for the first time the relationship between the chromosomal damage and the production of micronuclei on broad bean roots after neutrons and gamma rays action. Quite recently Heddle [4], Heddle and Harris [5], Schmid [6], [7] and other scientists have elaborated a new and rapid method, the so-called "micronucleus test", for the detection of chromosomal damage after different treatments (irradiation and chemical action).

Our purpose was : 1) to find if there is a linear correlation between the applied doses and the number of micronuclei and 2) if a similar correlation can be established between the DNA content and the number of micronuclei.

### MATERIAL AND METHODS

Many of the methods used in this paper were previously published by us [8]. Here we refer to the micronuclei number method. They were counted on interphase cells and for each dose of irradiation about 2 000 cells were computed. The number of micronuclei was expressed in per cents as compared to the total number of cells.

### RESULTS AND DISCUSSIONS

Fig. 1 shows the relationship between applied doses of X rays and the number of micronuclei in percents for 2 000 cells. The relation is quite linear especially 24 hours after irradiation. At 48 hours after irradiation there is a similar relationship, differing at 300 and 500 R when the percent of micronuclei suddenly increased. We have also computed the coefficient of correlation ("r") and found a very strong correlation

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between the number of micronuclei formed and the doses applied. T "r" was 0.99 at 24 hours and 0.97 at 48 hours after irradiation. This li relation proves that in spite of the renewing action of "quiescent z of the root [1], [2] after irradiation, the chromosomal damage took p irrespective of conspicuous repair and increase of the DNA amou 300 and 500 R.

In this connection we also computed the coefficient of correla between the DNA content per nucleus and the number of micronuclei a different doses of irradiation. The general realationship is a very w one, "r" being 0.10 at 24 hours and 0.24 at 48 hours after irradiation. T

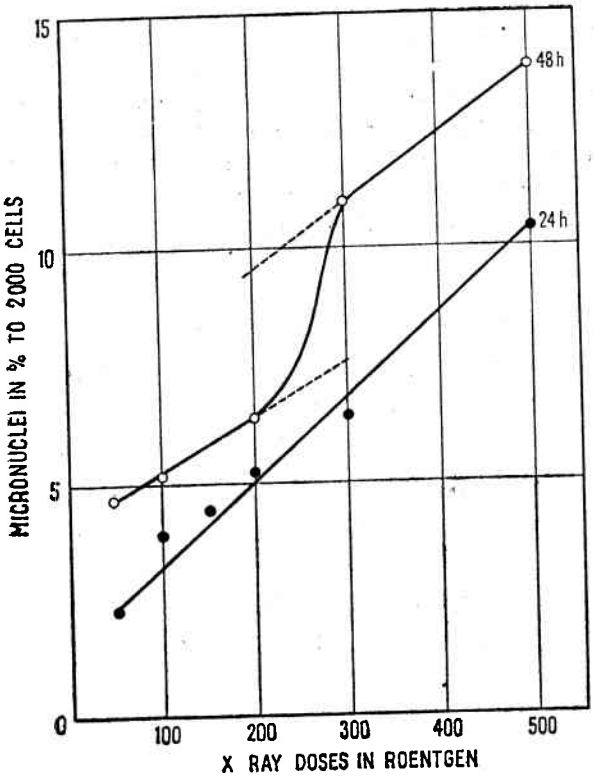


Fig. 1. — The relation between the applied doses of X rays and the number of micronuclei within meristemic cells of broad bean (*Vicia faba*).

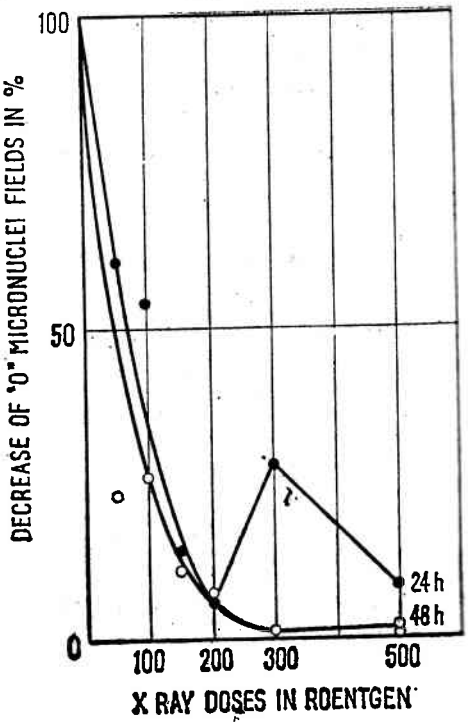


Fig. 2. — The relation between the applied doses of X rays and the decrease of "O micronuclei" fields in per cents within meristemic cells of broad bean (*Vicia faba*).

lack of correlation results from the increase of the DNA content per nucleus at 300 and 500 R. If the coefficient of correlation was computed for a limited section of the curve, i.e. between 50 and 200 R, a good correlation was obtained, but it was negative; "r" = —0.97 at 24 hours and — at 48 hours after irradiation. This means that the number of micronuclei increases when the DNA content per nucleus decreases. In fact, the number of micronuclei depends on the X rays doses applied and not on the DNA content per nucleus.

Fig. 2 shows the relation between the doses of X rays applied and the decrease of "O micronuclei" fields in per cents. The relation is expressed by a decreasing exponential curve. Fig. 3 shows, on histograms, the distribution of micronuclei per cells, expressed in per cents to 2 000 cells at different doses of irradiation and at 24 hours and respectively 48 hours

irradiation. The histograms show that the frequency of more micronuclei per cells increased with X rays doses. In spite of the fact that the DNA content per nucleus has increased again at 300 and 500 R, the histo-

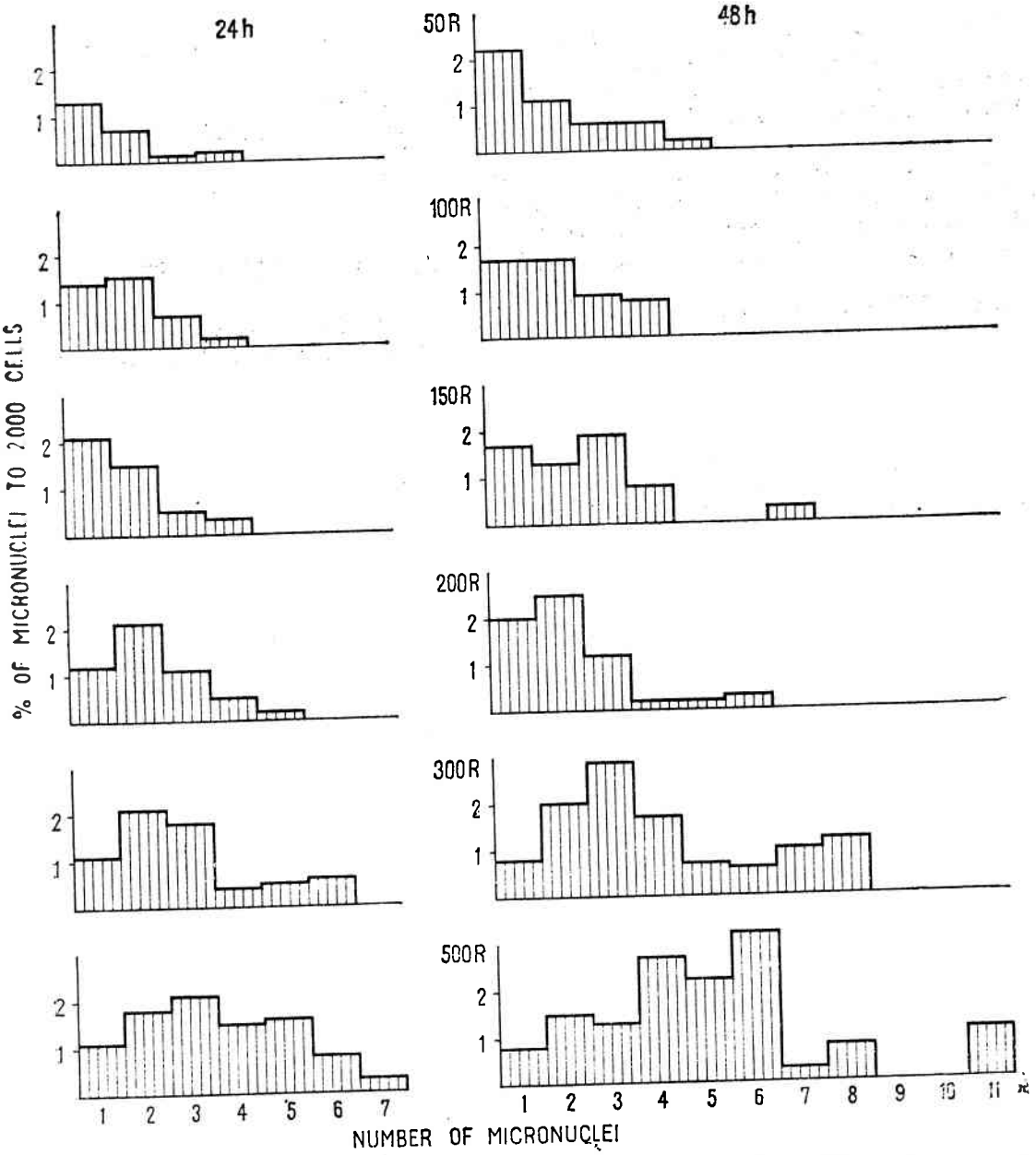


Fig. 3. — Histograms of micronuclei distribution per cell at different doses of X rays at 24 hours and 48 hours after irradiation.

grams show the appearance of more micronuclei, i.e. 6 — 11 per cell, as compared to 4 — 5 at 50 R. This is a clear proof that more chromosomal damages took place at higher doses of X rays.

## CONCLUSION

The "micronucleus test" proved to be a better method for the estimation of chromosomal damage than the variation of DNA content

per nucleus in the case of broad bean (*Vicia faba* var. *minor*) meriste roots irradiated in living conditions.

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