

2. Effects of irradiating dormant maize seeds on translocation frequencies at meiosis.

Dormant seeds of a maize single cross hybrid, L289/₁₂₀₅, were irradiated with various dosages of X-rays or thermal neutrons at the Brookhaven National Laboratory in the spring of 1952. The effects of the irradiations on the immediate generation were described in the 1953 Newsletter. Microsporocyte samples were taken from these same plants in order to determine the interchange (translocation) frequencies at different dosages. These results for the two planting dates are presented in table 2, along with the mature plant stand expressed as a percentage of the control. In addition to the X-ray dosages listed, treatments of 24,000 r and 32000 r units were also given, but the stands were negligible at both planting dates, indicating that the upper range of dosages was too severe. There were no mature plants for the May 15 planting date of the 16,000r X-ray treatment and of the two highest thermal neutron treatments. This was due to the dry soil crust at the time of emergence of the second planting, which killed the seedlings most severely affected by the irradiations.

In those cases where sufficient stands were obtained at the two planting dates, a comparison of the interchange frequencies for the two dates with in a treatment can be made. For each of the four lowest thermal neutron treatments there was no significant difference in interchange frequency between the two planting dates, and for 4000r the difference was barely significant. On the other hand, for 16,000r and for two of the thermal neutron treatments, namely, 18.9 and $24.8 \times 10^{12} N_{th}/cm^2$, the differences were highly significant. The only plausible reason advanced to account for these results is that the plants having chromosomal aberrations were later in maturing than those lacking them, and that sampling at the first planting date was done over too short a period of time to include the later and more aberrant plants.

Because of the discrepancies between two planting dates it is difficult to make any comparisons between the X-ray series and the thermal neutron series. There is some indication in both series of a leveling-off in interchange frequency at the higher dosages.

Table 2. Interchange frequency at microsporogenesis in maize for different dosages of X-rays and thermal neutrons and for two planting dates.

Treatment	Planting Date	Survival (% of Control)	No. of plants sampled	Interchange*		Frequency Per 100 Plants
				Total No.	Interchange*	
Control	May 3 and May 15, 1952	100 (803/1000)	135	1		.7
X-rays 4,000 r	May 3	110.3	118	11	9.3	
	May 15	87.7	84	16	19.0	
8,000 r	May 3	96.9	133	34		25.6

	May 15	25.2	86	66	76.7
16,000 r	May 3 May 15	21.2 No plants	54 --	23 --	42.6 --
N_{th} ($\times 10^{12}/\text{cm}^2$)					
5.8	May 3 May 15	102.6 98.6	75 44	14 5	18.7 11.4
10.5	May 3 May 15	103.1 116.1	84 80	15 14	17.9 17.5
10.7	May 3 May 15	103.1 89.2	85 52	12 14	14.1 26.9
17.3	May 3 May 15	94.6 96.1	85 67	19 23	22.3 34.3
18.9	May 3 May 15	109.1 106.1	107 123	47 100	43.9 81.3
24.8	May 3 May 15	103.1 49.3	87 47	52 52	59.8 110.6
31.4	May 3 May 15	86.2 No plants	123 --	86 --	69.9 --
41.7	May 3 May 15	46.3 No plants	68 --	52 --	76.5 --

*An interchange involves two chromosomal breaks.