

1. Effects of X-ray and thermal neutron radiations of dormant seeds of maize on the immediate generation.

Dormant seeds of maize were irradiated with different dosages of X-rays or thermal neutrons at the Brookhaven National Laboratory in the spring of 1952. Field plantings of 250 seeds per treatment were made at Lincoln, with two replications per treatment for each of two planting dates. The dosages of X-rays and thermal neutrons used are shown in Table 1.

Table 1. Percentages of chlorophyll chimeras, leaf slashes and twin stalks in maize for various dosages of X-rays and thermal neutrons, including two planting dates and four replications.

Treatments	Chimeras	Leaf slashes	Twin stalks	Number of plants
Control	2.4	1.7	0	803
<u>X-rays</u>				
4,000 r	11.9	28.1	0	797
8,000 r	15.9	24.3	1.8	490
16,000 r	13.0	20.7	0	92
24,000 r	15.4	19.2	3.8	26
32,000 r	21.1	31.6	0	19
<u>Thermal neutrons (N<sub>th</sub>/cm<sup>2</sup>/sec.)</u>				
5.8 x 10 <sup>12</sup>	10.4	26.0	0	404
10.4 x 10 <sup>12</sup>	18.0	30.0	0	440
10.7 x 10 <sup>12</sup>	17.6	31.3	0	386
17.3 x 10 <sup>12</sup>	13.2	30.9	.8	385
18.7 x 10 <sup>12</sup>	18.1	36.6	4.4	432
24.8 x 10 <sup>12</sup>	21.2	41.2	3.3	306
32.1 x 10 <sup>12</sup>	18.5	17.3	5.2	173
41.7 x 10 <sup>12</sup>	26.4	48.4	6.6	91

Survival from irradiation effects could not be determined accurately in the field since plants heavily injured by irradiation, which would have survived under greenhouse conditions, were killed by adverse environmental factors, such as a dry surface crust at the time of emergence or a prevalence of smut spores which gained access through the necrotic streaks in the leaves. However, it was apparent that plant stands were severely reduced by X-ray doses of 16,000 r and higher, and by the highest thermal neutron treatment.

Notes were taken on the growing plants for chlorophyll chimeras, slashing of leaf margins and twin stalks. The chimeras included chlorophyll changes to white, cream, various shades of yellow and green, and, in a few cases, a mottled effect of dark spots upon a light background. In some cases the same chimera occurred in an identical area on both leaf surfaces. A few instances were noted in which adjacent stripes or bands of different colors formed multiple chimeras. Leaf slashes occurred as longitudinal cuts in the margins, either on one side of the midrib or on both sides in identical areas. The slashes were distinctive from the streaking of seedling leaves which later formed necrotic tissue with consequent shredding.

The frequencies of chimeras, leaf slashes and twin stalks for all replications of both plantings are presented in Table 1. Whereas chimeras and leaf slashes were observed in the untreated series, it is evident that both X-rays and thermal neutrons caused a considerable increase in their frequencies, with a tendency toward relationship with dosage. The occurrence of twin stalks was confined to the higher radiation dosages and also showed some relationship with dosage. In most of the cases of twin stalks observed each stalk formed its own tassel and ear shoot.

Microsporocyte, pollen and ear samples were taken from all treatments for studies of chromosomal aberrations, pollen abnormalities, and ear sterilities, respectively. These studies are in progress.