

2. Effect of seed irradiation on the activities of various enzymes in corn.

Seeds of the single cross hybrid, L289 x I205, were irradiated with X-rays or thermal neutrons at the Brookhaven National Laboratory. The following dosages were used: X-rays-- 4,000, 10,000, 40,000, and 80,000 roentgen units; thermal neutrons-- 5.3×10^{12} , 7.8×10^{12} , 16.1×10^{12} , and 23.3×10^{12} neutrons per square centimeter. Preparations of embryos, etiolated shoots (excised at the scutellar node), and green seedlings (excised at the coleoptilar node) from control and irradiated seeds were assayed for catalase, cytochrome oxidase, peroxidase, phosphatase, and polyphenolase activities. In the assay of embryo preparations, no appreciable differences were noted among the treatments. Similarly, the experiments with etiolated shoots failed to disclose any striking differences in enzyme activity between irradiated material and controls, although it appeared that there was some tendency for the polyphenolase activity of shoot preparations to increase with increasing dosage of thermal neutrons. In the work with green seedling preparations, however, marked differences were found between control seedlings and seedlings grown from irradiated seeds. From the data presented in table 1, it appears that irradiation-induced height reduction is associated with increased activities of catalase, peroxidase, phosphatase, and polyphenolase in the seedling preparations. The full significance of this observation is not known, but it does seem clear that there are differences in certain types of enzyme activity between irradiated and control treatments.

Table 1. Specific activities of five enzymes in preparations of 10-day green seedlings grown from control and irradiated seeds of L289 x I205 corn.

Seed treatment	Seedling height (mm)	Specific activity ^a				
		Catalase	Cytochrome oxidase	Peroxidase	Phos-phatase	Poly-phenolase
Control	260	24	0.61	31	1.6	2.1
5.3×10^{12} N _{th} /cm ²	250	23	0.55	39	2.0	2.7
7.8×10^{12} "	225	24	0.60	39	2.0	2.7
16.1×10^{12} "	138	25	0.67	53	2.2	5.4
23.3×10^{12} "	42	61	0.71	169	4.1	8.9
4,000 r X-ray ^b	108	34	0.52	59	3.0	10.0

^aSpecific activities are expressed in the following units per min. per mg protein N:

- catalase--micromoles H₂O₂ destroyed
- cytochrome oxidase--micromoles cytochrome c oxidized
- peroxidase--increase in optical density at 460 μ
- phosphatase--micromoles p-nitrophenol liberated
- polyphenolase--increase in optical density at 410 μ

^bThis was the only one of the X-ray treatments in which sufficient seedling material was obtained for enzyme assays.

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