5. Mutation in maize following the application of chemical mutagens to the pollen and proembryo.

The mutagenic effect of several alkylating agents upon the expression of several maize endosperm loci following their application to the mature seed was reported in the 1965 News Letter. Molar concentrations of the chemicals were also applied to cotton wrapped maize tassels 3 to 5 days prior to anthesis in order to determine their effect upon the developing male gametophyte.

The treatment was accomplished by saturating the cotton wrapped tassel with an aqueous chemical solution for a period of 3 hours. The treated tassels were not rinsed with water or covered, but were allowed to dry. Successive daily pollinations were made to the recessive seed parent and the resulting progenies were scored for whole or partial mutant endosperm events. The chemicals, molarities, and per cent mutation are presented in the following table.

Chemical mutagen	Conc. M.	No. of progeny	Mutation rate %
Ethyl Methanesulfonate (EMS)	.0125	281	1.06
	.025	428	1.17
	.05	1190	2.94*
	.1	343	4.08*
	.2	263	7.60*
Diepoxybutane (DEB)	.0012	952	1.05
	.0025	225	.89
	.005	785	2.93*
	.01	458	3.28*
Diethylsulfate (DES)	.045[a]	616	1.79
Ethyleneimine (EI)	.0125	1236	1.38
	.025	1105	.45
	.05	457	.44
	.1	1363	.51
Control	0	3057	.75

*Mutation rate exceeds the control at the .05 level of significance following correction for small numbers.

[a]Saturated solution at 20°C.

The non-treated parts of the tassel were removed immediately after treatment and the successive pollinations were made starting at the time of first pollen shed which was three days following treatment. Comparisons were made of the mutation rate of the treatments with the control for the same pollination date. There was a significant increase in mutation rate for the pollination dates which occurred five and six days after the initial treatment. The data indicate that the less mature pollen grains were most sensitive to the alkylating agents.

The chemicals were also applied to cotton wrapped ears at 24, 48, and 72 hours after pollination in an effort to induce massive endosperm and embryo chimeras. The endosperm mutation rates, chemicals, age of proembryo, and molarity of treatment solution are presented in the following table. All treatments were of 2 hours duration.

Age of proembryo	Chemical mutagen	Conc. M.	No. of progeny	Mutation rate %
24 hrs.	DEB	.0025	825	5.30*
	EMS	.1	737	1.90
	DES	.045[a]	498	.80
	EI	.1	1127	.62
	Control	0	805	.62
48 hrs.	DEB	.0025	1259	2.30*
	EI	.1	2294	.44
	EMS	.1	2458	.37
	DES	.045	939	0
	Control	0	1397	.14
72 hrs.	DES	.045	2199	.41
	DEB	.0025	2039	.39
	EI	.1	1873	.27
	EMS	.1	2183	.18
	Control	0	1432	.07

*Mutation rate exceeds the control at the .05 level of significance following correction for small numbers.

[a]Saturated solution at 20°C.

The DEB treatment was the only significantly effective treatment in the 24 and 48 hour age groups. None of the chemical applications were effective in the 72 hour age group. Nearly all of the mutants that were produced were partial mutants.

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