plants dug in August and September. These measurements include scores for root type, root abundance, apparent disease resistance, brace roots and fine roots. Correlations between these measurements and yield and moisture at harvest, taken on top-cross progenies of these inbreds in 1957 are presented in Table 1.

Table 1. Correlation coefficients between various root and yield measurements obtained from three-way hybrids involving inbred lines and two single cross testers grown in 1957.

	Type	Abundance	Disease	Fine Roots	Brace Roots
Yield	+.403	+.300	+.232	+.356	+.282
Moisture Per Cent	+.433	+.304	+.313	+.418	+.344
Fine Roots	+.656	+.776	+.708	1.000	+.268

Significant r at 1 per cent level = .239.

The corn roots were dug with a mechanical digger which enabled the removal of a definite portion of the root system free of soil. The roots harvested by this procedure made it possible to carefully remove for observation and scoring the main and fine branches of the secondary root system. The 1957 results suggest "fine roots" as one of the most useful morphological characters in selecting for root rot resistance in corn.

Diallel crosses between the four most resistant and the four most susceptible lines developed in this work have now been made, along with outcrosses to an early and a late tester. This material, when grown in 1959 and 1960, should furnish information on the heritability of root rot resistance.

The 1957 data show that top cross progeny root rot scores have little correlation to similar scores taken on inbreds. The possibility of heterosis or overdominance effects is indicated.

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2. Modification of cold resistance and combining ability of corn inbreds by Cobalt 60 treatment.

Dormant dry seeds of two long time inbred lines of maize, S.D. 5 and B8, were treated with 4750r units of gamma irradiation from a Cobalt 60 source in 1957, immediately prior to planting. Plants grown from the irradiated seeds of each inbred were selfed and outcrossed to check

plants of the other inbred.

Standard cold germination studies using soil from a continuous corn rotation were run on seed of the selfed irradiated inbreds in comparison with untreated checks. Highly significant differences among irradiated inbred progenies in cold resistance were obtained for both S.D.5 and B8. The array of inbred cold resistance scores, based on four replications is given in Table 1.

Table 1. Frequency Array of Cold Resistance Scores of Two Irradiated Corn Inbreds, S. D. Experiment Station, 1958.

Score	Class	Number of Irradiated S.D.5 Selfs	Number of Irradiated B8 Selfs
0-19	1	0	1
20-39	2	4	2
40-59	3	14	6
60-79	4	20	15
80-99	5	10	19
100-119	6	3	10
120-139	7	1	1
140-160	8	0	0

Population performances from the cold tests were:

	$\bar{x}$	s^2	F
Irradiated S.D. 5 selfs	17.14	57.32	1.56**
Check S.D. 5 selfs	23.99	36.72	
Irradiated B8 selfs	20.27	67.47	1.85**
Check B8 selfs	24.42	36.45	

Yield tests of single crosses each involving one irradiated and one check parent, were run in a 12 x 12 lattice in 1958. Possibly because of the dry season, no significant differences between crosses involving an irradiated parent were obtained, nor did these singles differ as a group from the non-irradiated check single cross.

The 1958 results suggest that irradiation of seeds reduced the average cold resistance of both S.D.5 and B8 selfed progenies in comparison to the checks, although the range of variation indicates that some lines exceeding the cold resistance of the parent inbreds might be selected from the irradiated and selfed population.

It had been hoped that dominance effects in the single cross might limit unfavorable or deleterious mutation effects in the irradiated parent. The 1958 yield test which showed no significant differences among 136 single crosses involving an irradiated inbred, or of the inbreds in comparison with the yield of the check single cross, indicates that this has not been disproved. Cold tests and the appearance of visible mutants suggest that irradiation had been effective, and if yield were largely due to additive gene action, differences between checks and irradiated singles might have been expected.

This work is being continued with one additional inbred, so that three single crosses will be tested in 1959.

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1. "Tassel ear" mutation.

A mutant which produces only staminate flowers in the lateral inflorescences was found in selection F735 in 1955 by Mr. B. Stead in the Union of South Africa who sent me seed of the stock. Out of 21 plants grown in 1956, one plant developed a chlorophyll deficiency in the upper half of the plant following tasseling, two plants had japonica striping and one plant had the lateral inflorescences made up entirely of staminate flowers. All abnormal plants were late flowering and were pollen sterile. A cross of a late inbred on a heterozygous plant segregated 8 "tassel ear" plants to 29 normal plants in F_2 in 1958. "Tassel ear" plants tillered profusely and five or six lateral inflorescences developed on the more vigorous tillers. Normal length shanks with husk leaves from the nodes were produced but fully developed tassels replaced the ears. Usually the central spike, and often one or two branches, emerged beyond the husks. These staminate flowers produced an abundance of fully viable pollen, as did the terminal tassel.