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1. Evaluation of mass-selected populations based on performance of selected S_2 line topcrosses.

In 1968, approximately 1000 plants of the Hays Golden variety (HG) and of each of three improved mass-selected populations were grown in the nursery. The three improved populations were derived from HG by (1) mass selection for high grain yield for 12 generations (C12), (2) thermal neutron irradiation of seeds plus mass selection for high grain yield for 13 generations (I13), and (3) mass selection for prolificacy for 7 generations (P7). Approximately 300 of the best-appearing plants were self-pollinated in each population, and seed was saved from those that were disease-free and standing well at harvest. In 1969, selection was practiced between and within S_1 lines of each population, and selfed seed was saved from the best plant of each selected line. Further selection between and within S_2 lines was practiced in 1970. Selected S_2 lines were also topcrossed to Oh43 and to the single cross N7A x N7B.

Table 1. Grain yield (q/ha) of selected S_2 line topcrosses.

Tester	Popn.	No. of lines	Grain yield q/ha					
			Mean	Range		Best lines		
				Low	High	Top 5	Top 10	Top 20
Oh43	HG	100	88	67	101	99	98	97
	C12	90	98	82	117	112	111	109
	I13	80	96	74	114	109	107	105
	P7	72	97	77	114	110	108	105
	Checks	9	94	72	114	106		
N7AxN7B	HG	99	90	69	108	104	101	99
	C12	119	96	70	114	112	109	107
	I13	92	95	70	110	109	107	105
	P7	81	94	70	119	109	106	104
	Checks	9	84	69	107	93		

The hybrids developed by topcrossing were grown in yield trials in 1971. Plot size was 5.8 M² and plant density was 51,666 plants per hectare. Preliminary yield results are presented in Table 1.

Hybrids involving lines from selected populations show a definite superiority over those from the parent population whether you look at the mean of all lines, the highest yielding line or some subset of the highest yielding lines. Although lines from the three selected populations performed somewhat the same, the Cl2 lines appear to have a slight advantage over Il3 lines. We can also conclude that 7 generations of mass selection for prolificacy was about as effective as 12 or 13 generations of mass selection for high grain yield. Hybrids involving lines from improved populations compared very favorably in yield with the best Nebraska Experiment Station hybrids included as checks. One hybrid check, a cross between two related lines (N7A x N7B) was a relatively low yielder as shown in Table 1.

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1. Effects of genetic and environmental factors on production of phytoalexin from *Helminthosporium turcicum* of *Zea mays*.

Genotypes used were Ht Ht Bx Bx, Ht ht Bx Bx, Ht Ht bx bx, ht ht Bx Bx, and ht ht bx bx (see MGCNL 45).

Production of inhibitory substances (presumably phytoalexin) decreased in the following order, as determined by a bioassay test with leaf diffusates on spore germination: Ht Ht Bx Bx, Ht Ht bx bx, Ht ht Bx Bx, ht ht Bx Bx, ht ht bx bx, and control (sprayed with water only). Differences between genotypes were all highly significant. Ht ht Bx Bx was much less inhibitory than Ht Ht Bx Bx.

Environmental factors studied were: attached or detached leaf, inoculum concentration, predisposing temperature, seedling age, and days from inoculation until collection of diffusate. These all significantly affected production of phytoalexin.