

were grown in replicated tests at 5 locations for 5 years. The components of variance estimated from a combined analysis of variance are given in Table 1. The variation attributed to interactions

Table 1. Estimates of Components of Variance in the Jarvis Variety

Variance among half-sib families . . . . .	.0007
Variance due to interaction of families and locations	-.0001
Variance due to interaction of families and years	-.0001
Variance due to interaction of families and years x locations . . . . .	.0005

between families and locations, and between families and years is very small, whereas the second order interaction involving locations, years and families is of importance. This implies that the important interaction variance is simply due to family x environmental interaction without regard to years and locations. The variance due to families is estimated to be larger than the variance due to interaction of families and environments.

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2. Heterosis in crosses of varieties from different geographical regions.

The objective of this study is to determine the relative amounts of heterosis obtained when locally adapted corn varieties were crossed with each other and with varieties from different regions. Geographical separation and isolation leads to genetic diversity through genetic drift and adaptation to different environments. The degree of genetic diversity should be reflected in greater amounts of heterosis in "between region" crosses than for "within region" crosses.

This experiment included two North Carolina varieties, Jarvis and Indian Chief; two midwestern varieties, Krugs and Reids Yellow Dent; and two Puerto Rican varieties, Diente de Cabolla and Mayorbela. These were crossed in all possible combinations. However, one of the crosses, Diente de Cabolla x Krugs, did not produce sufficient seed and was not included in the test. This study was planted in five replicates at two locations for three years.

The average yields for each variety and variety cross are given in Table 1. The highest yielding entry was the cross, Indian Chief x Diente de Cabolla, and the second highest was Indian Chief x Mayorbela. Both of these represent a cross between a locally adapted and an unadapted variety. Table 2 gives the yield of the crosses expressed as per cent of the average of the two parental varieties. The greatest amount of heterosis (as measured from the midparent) occurred in the cross Reids Yellow Dent x Mayorbela. The cross between the two Puerto Rican varieties was less than the midparent. The average heterosis of the "within region" crosses is 3%, and for the "between region" crosses is 25%. The greatest amount of heterosis, on the average, occurred in crosses between midwestern varieties and Puerto Rican varieties. Considering the "between region" crosses, crosses between the North Carolina varieties and the midwestern varieties showed the smallest amount of heterosis, averaging 14% above the mean of the parental varieties.

Table 1. Average Yield of Varieties and Variety Crosses

	Jarvis	Indian Chief	Krugs	Reids Yellow Dent	Diente de Cabolla	Mayorbela
Jarvis . . . . .	.510	.569	.480	.520	.528	.544
Indian Chief . . . . .		.533	.549	.551	.617	.586
Krugs . . . . .			.371	.453	--	.500
Reids Yellow Dent . . . . .				.430	.535	.560
Diente de Cabolla . . . . .					.364	.317
Mayorbela . . . . .						.374

Table 2. Yield of Variety Crosses in Per Cent of Midparent

	Indian Chief	Krugs	Reids Yellow Dent	Diente de Cabolla	Mayorbela
Jarvis	109	109	111	121	123
Indian Chief		122	114	138	129
Krugs			113	---	134
Reids Yellow Dent				135	139
Diente de Cabolla					86

These results agree, in general, with expectations based on genetic diversity between varieties due to isolation and adaptation to different regions, and further indicate that the maximum yielding crosses may not result from intercrossing the highest yielding parental varieties.

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1. Inheritance of resistance to *Diplodea zeae*, *Gibberella zeae* and *Fusarium moniliforme*, stalk rots in corn.

In a preliminary survey, twelve different fungi were isolated (and identified) from diseased stalk tissues of 25 inbred lines of corn grown under normal field conditions at Fargo, North Dakota. No single organism was clearly defined as being predominantly responsible for the stalk rot observed.

In a subsequent detailed study, five inbred lines and their respective F₁ and F₂ progenies were stem-inoculated, after pollination was completed, with pure cultures of *Diplodea zeae* (Schw.) Lev., *Gibberella zeae* (Schw.) Petch and *Fusarium moniliforme* (Sheld.) Snyder and Hansen. The results obtained were as follows: