AN ADEQUATE genetic explanation for yield heterosis in corn has been sought for many years. Unfortunately, many of the data that have been accumulated can be interpreted equally well by the dominance or the overdominance hypothesis. It appears desirable to obtain additional data bearing on the adequacies of these two hypotheses since the efficiency of various breeding operations is related to the types of gene action involved. The present study was designed to provide additional information on the relative importance of these two types of gene action.

**REVIEW OF LITERATURE**

The extensive literature reviews of heterosis presented elsewhere will not be repeated here. Recurrent selection for specific combining ability and type of gene action involved. The present study was designed to provide additional information on the relative importance of these two types of gene action.

**MATERIALS AND METHODS**

The material used in the present study involved two open-pollinated varieties, Lancaster Surecrop and an Indiana strain of Reid designated here as Kolkmeier. The tester parent for the first cycle was the single cross WF9 × Hy and for later cycles the long-time inbred line, Hy. In the first cycle selected plants of the two open-pollinated varieties were self-pollinated and at the same time crossed on to the common single cross tester parent, WF9 × Hy. The Kolkmeier testcrosses were grown at Lafayette, Indiana, in 1943 and the Lancaster testcrops in 1944. Bulk seed of the original varieties as well as remnant S1 seed of 5 selected plants of each variety having superior testcross performance were supplied to the senior author by A. M. Brunson in 1949. Diallel crosses involving the five S1 lines representing each varietal source were made. These intercross populations were increased by self-pollination and designated as Lancaster C1 and Kolkmeier C1, respectively. The same intercross material was also planted on an intercross progeny basis and resampled. Selected plants in each intercross progeny were self-pollinated and outcrossed to the line Hy as a common tester parent. The two series of testcrosses (variety A and variety B) were grown at the same location for the same period to insure direct comparability of results. Remnant S1 seed involved in the 10 highest yielding testcrosses of each series was grown and the intra-varietal diallel crosses produced. Equal numbers of seeds from each single cross were composited and the self-pollination increases resulting were designated as Lancaster C2 and Kolkmeier C2, respectively. Selfing and test-crossing of individual plants within each of these series have been continued.

The individual yield trials of testcrosses will be used to provide estimates of genetic variance and expected genetic gains. However, a more precise measure of progress has been attempted by producing seed of Lancaster C1 × Hy, Lancaster C2 × Hy, etc., as well as Lancaster C1 × Kolkmeier C1, etc., and comparing such crosses in a common experiment repeated over locations and years.

**EXPERIMENTAL RESULTS**

The data presented here have a bearing on three rather distinct problems. The first of these relates to the effects of successive cycles of recurrent selection for combining ability on improvement in yield relative to a specific tester. The second relates to the effect of the selection practiced on genetic variability and the yields of the successive cycles as distinct populations. The third involves the performance of crosses between populations involving comparable levels of selection. The data will be presented in the order listed.

In the material presented in table 1, C0 refers to the original varietal population. C1 is the designation for the population formed by the production of the n(n-1)/2 intercrosses of the selected S1's from the C0 population and the increase of such intercross populations by random self-pollination followed by bulk composting of the seed obtained. The C2, is comparable with the C1, except that the selected S1's were derived from the C2 instead of from the C0 cycle. Each of the C2 populations was then crossed to the inbred tester Hy. Normally 40 to 50 crossed ears were produced for each combination. The crossed seed from each mating was bulked and samples drawn from this bulk used in comparative yield trials. Comparative yield trials were conducted at 2 locations for a 3-year period. The results obtained are presented in the yield column of table 1.

The figures presented in the column "calculated genetic advance" were obtained from the experiments comparing the individual testcrosses within each cycle. The formula used was as follows:...