Effects of Heterosis on the Major Components of Grain Yield in Corn

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SINGLE crosses (F₁ hybrids) between inbred lines of corn normally outyield either of the respective parental lines by a wide margin. This conspicuous example of heterosis has been well known since the publication of the pioneering observations of Shull (8), and has been utilized for many years in the commercial production of hybrid corn. Yet, very little published information is available regarding the effects or manifestations of heterosis on the major components of grain yield in corn. It would appear that such information is basic to studies of the inheritance of yield components or of the nature of heterosis in corn.

Total grain yield per plant in corn is the product of the following major components:

1. Number of ears per plant
2. Weight of grain per ear
   a. Kernel weight
   b. Number of kernels per ear
      (1) Row number
      (2) Number of kernels per row

Of these six components, four—number of ears per plant, kernel weight, row number, and number of kernels per row—are relatively distinct morphological entities which cannot readily be further subdivided. These may be regarded as primary components of grain yield. Weight of grain per ear and number of kernels per ear are more complex or secondary components, since they are the product of one or more of the primary components.

Data are presented in this paper on the effects of heterosis on all six of the major components of grain yield listed above, as well as on total yield itself. These data were obtained during the period 1947–1950 in the course of detailed studies on the inheritance of yield and other agronomic characters in corn.

For the purposes of this paper, heterosis was considered to have been expressed in any case in which the F₁ hybrid between two inbred lines exceeded the higher parental line ("top parent") in the expression of the character being considered.

MATERIALS AND METHODS

All tests discussed in this paper were conducted on the Agronomy South Farm of the Illinois Agricultural Experiment Station, Urbana, Ill. In all, 109 individual comparisons were made in four replications each, involving 92 different F₁ hybrids and their respective inbred parents. Data on total grain yield were obtained only in 1950; the other characters were studied during the period 1947–1950.

Yield data were calculated from the field weights of ear corn, using corrections for missing hills, shelling percentage, and dry-matter content to compute yields on the basis of shelled corn at 15.5% moisture.

Ear number was computed and expressed as the number of ears per 100 ear-bearing plants, to eliminate the effects of sporadic barrenness. The second ears from 2-eared plants were saved separately, and were not included in the samples from which row number, number of kernels per row, and kernel weight were determined.

Row number and number of kernels per row were determined by actual counts made on all first ears harvested.