THE VARIABILITY OF CERTAIN QUANTITATIVE CHARACTERS OF A DOUBLE CROSS HYBRID IN CORN AS RELATED TO THE METHOD OF COMBINING THE FOUR INBREDS

Emmett L. Pinnell

It has become a common practice by many corn breeders to make single crosses within a group of inbred lines, test these in yield trials, and predict the performance of double crosses. The yield of a particular double cross is predicted from the average of four of the six possible single crosses that can be made from four inbreds, the two parental single crosses not being used in the average.

In a consideration of the prospective performance of double crosses, relative yields, disease reaction, and lodging resistance are of primary importance. In addition, uniformity of characters of a double cross is given consideration. The problem arises as to whether it is possible to predict the degree of uniformity in a double cross on the basis of a study of the characters of the inbred parents and of their single crosses. This paper presents data obtained from inbreds, single crosses, and double crosses, using four inbreds which differed widely in several characters.

REVIEW OF LITERATURE

Jenkins (7) was the first to present data on methods of predicting the performance of double crosses. One of his methods was to average the performance of the four non-parental single cross combinations. This method fairly well represents the actual hybrid combination occurring, since, as Jenkins states, "In any double cross the genes of each of the four parental lines are united only with allelemorphs of the two lines which enter the double cross from the opposite parent."

Doxtator and Johnson (2) showed that significant differences in yielding ability could be found in the three double crosses from the same four lines and that these differences were predictable by the above method.

Anderson (1) also predicted yields in this manner and obtained a correlation of .90 between predicted and actual yields of 15 double crosses.

In a recent paper, Hayes, Murphy and Rinke (6) present further results of the application of this method at Minnesota.

Eckhardt and Bryan (3) measured individual plants in double crosses involving two inbreds from each of two varieties. Designating inbreds from one variety as A and B and those from another variety as Y and Z, they found that hybrids

---

1 Contribution from the Division of Agronomy and Plant Genetics, University of Minnesota, St. Paul, Minn. Paper No. 2065 of the Journal Series, Minnesota Agricultural Experiment Station. Part of a thesis submitted in partial fulfillment of the requirements for the degree of master of science at the University of Minnesota. Received for publication February 1, 1943.

2 Research Fellow in the Division of Agronomy and Plant Genetics. The writer wishes to express his sincere appreciation to Dr. H. K. Hayes, under whose direction the study was made, to Dr. F. R. Immer for advice regarding analysis of the data, and to Mr. Antonio Marino of Argentina and Mr. D. C. Anderson of Missouri for furnishing seed of the double crosses used in the study.

3 Figures in parenthesis refer to "Literature Cited", p. 514.