A COMPARISON OF SYNTHETIC VARIETIES, MULTIPLE CROSSES, AND DOUBLE CROSSES IN CORN

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MOST of the corn hybrids as now used commercially are double crosses, although single and three-way combinations are used to a limited extent. Relatively little has been done with hybrids involving more than four inbred lines. A knowledge of the performance of such combinations would be of interest from several standpoints. First, it would add to our general knowledge of corn breeding. Their theoretical behavior can be formulated from known genetic principles, but there is little data indicating the agreement between theoretical and actual performance. Second, in some areas outside the Corn Belt considerable difficulty has been experienced in maintaining inbred lines and in producing seed of foundation single crosses. Multiple crosses may be better suited for commercial utilization in these areas than are double crosses. Third, in the course of inbreeding investigations, many inbreds are isolated which possess certain desirable characteristics but because of some specific fault are unsuited for present commercial use in double crosses. Such lines might be of use in crosses involving larger numbers of lines.

For the purpose of this report, a multiple cross is defined as the first generation of a cross containing more than four inbred lines. Either the first generation or the advanced generations of such a combination may be used for commercial corn production. When the advanced generations are grown and the strain is maintained by mass selection, it usually is defined as a synthetic variety. First-generation seed of a multiple cross may be produced by crossing first-generation plants of the two parental hybrids, or by crossing plants of the advanced generations of them. If the two parents of a multiple cross involve as many as 4 to 8 lines each, it may be feasible to maintain them independently as synthetic varieties and produce first-generation hybrid seed of the final multiple combination by crossing the advanced generations of the parental strains.

The theoretical advantages of a multiple cross produced by crossing plants of the advanced generations of its parents are (a) higher yielding ability than synthetic varieties, and (b) less costly foundation seed stocks than for double crosses. Multiple crosses should possess more genetic diversity which should make them less subject to environmental hazards than double crosses. Their theoretical disadvantage lies in the smaller yield expected from a combination involving more than four lines, as compared with the best double cross among the best four of the parental lines.

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1Contribution from Farm Crops Subsection, Iowa Agricultural Experiment Station, Ames, Iowa, and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Dept. of Agriculture, cooperating. Journal paper J-1041, Project 163. Received for publication September 18, 1942.

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