HYBRIDS between flint and dent corn have proved well adapted to marginal areas where low temperatures and short growing season become limiting factors. Ideally, corn for these areas has the cold tolerance and early maturity of many flints, and the yield and seed characteristics of established dent hybrids. This report deals with the performance of three flint and three dent lines in the $S_2$ and $S_3$ generation in various hybrid combinations, and with the relationship between yield, morphological appearance, and variability.

Early testing was suggested by Jenkins (6), and studies on this subject by various other workers have been reviewed by Sprague (9). The importance of early testing is generally recognized, although many inbreds usually are discarded for reasons other than lack of combining ability.

The literature on the comparative value of different types of testers has been reviewed by Green (3) and Keller (7). Additional information was presented by Matzinger (8) and Grogan and Zuber (4). Matzinger found the information from a single cross tester and its component inbred lines to be highly specific. Line X tester interaction decreased as the genetic variability of a tester increased. Grogan and Zuber found that the agreement among testers for measuring yield potential varied with the group of inbreds involved in the test. Information on general combining ability could be obtained more economically by using one or two double crosses as testers instead of the averaged information from their parental single crosses. However, some single crosses were as efficient as double crosses in estimating general combining ability.

Differences between reciprocal flint-dent crosses are of importance because of the seed characteristics of the resulting hybrids. In Canada, Dimmock and Donovan (1) found a tendency for higher yield when the seed parent of a flint-dent hybrid was a dent type. They cited unpublished data from other workers who found no difference between reciprocal flint-dent hybrids.

Associations between yield and morphological appearance and variability are important in flint and dent strains since flint and dent strains differ widely in ears per plant, number of kernel rows, and kernel weight, all of which have a direct effect on yield.

MATERIALS AND METHODS

In 1955 an open-pollinated European flint variety, Gloria, 2 $S_2$ inbreds from this variety, an $S_3$ flint-dent variety Falconer, a Corn Belt synthetic, Brown County Yellow Dent, and 3 $S_8$ inbreds from these were planted in a crossing nursery at Madison, Wis. The open-pollinated flint and the dent synthetic were pollinated flint, the dent synthetic and the double hybrid W240 $F_0$ and $D_0$, respectively, the European flint line as the Falconer line as $F_3$, and the dent lines as $D_3$. Each of the 6 $S_8$ lines was crossed with the open-pollinated flint, with the dent synthetic, and with the remaining inbred lines, topcrosses and 15 single crosses. Seed of 27 double and 18 three-way crosses was produced in Florida in the winter of 1955-56. The $F_0$ and $D_0$ varieties were increased by selfing, the inbreds by sibbing.

In 1956 all crosses, together with the $S_8$ inbred flint, the dent synthetic, and the double hybrid were grown in 9 X 9 triple lattice trials at Madison, Wis. Plots consisted of 1 row of 10 hills at 40 in. 3 plants per hill. In the same year all crosses made in 1955 were repeated with the $S_8$ inbreds and the sib-inbreds. In addition, reciprocals were made of all flint-dent crosses, and 36 double crosses were added in the winter of 1956-57. Reciprocals of all crosses between flint and dent were made in 1957.

In 1957 all crosses made with $S_8$ lines, together with W270, W275, and W283A, were grown in 10 X 11 lattice trials at Madison and Spooner. At both locations both years whole plot data were obtained on yields, silking date (except at Spooner in 1957), percentage fresh weight, shelling percentage, and 1000-kernel weight as well as whole plot data were obtained on 18 morphological characters at Madison. Although stands were good, occasional corrections were made for missing plots; data expressed in bushels per acre at 15.5% moisture were calculated in all possible combinations. Variety coefficients were calculated in all combinations.