Relative Value of Two Testers for Estimating Top Cross Performance in Segregating Maize Progenies

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The top cross test has been used widely as a means of estimating the combining ability of new inbred lines of corn. Its use in corn breeding was first suggested by Davis (2), but the data of Jenkins and Brunson (6) probably are responsible for the wide acceptance of the method. They used open-pollinated varieties as tester parents in evaluating previously unselected lines and found significant and positive correlations between top cross and single-cross performance of the lines.

In recent years single-, double-, and double double-cross hybrids as well as synthetic varieties have been used as top cross tester parents. Very few critical data are available concerning the relative value of different tester parents. Davis (3) compared an adapted variety and what he called an “inbred-recessive,” but he crossed a different group of lines on each tester so that his comparison was confounded. Johnson and Hayes (7) found low correlations among the yields of a group of sweet corn lines top crossed on the parental variety, an unrelated variety, and an unrelated inbred line. They attributed this lack of relationship to the fact that insufficient replicates of the material were used. Beard (1) reported a close agreement among the top cross yields of seven inbred lines when two unrelated single crosses and an open-pollinated variety were used as testers. Lodging values for the lines differed with the testers.

The present study was initiated to determine the relative value of a low-yielding, lodging-susceptible variety and a high-yielding, lodging-resistant double-cross hybrid as top cross tester parents.

MATERIALS AND METHODS

The two testers chosen for comparison were U. S. 35, (WF9 × 38-11) × (Hy × R4), and an open-pollinated strain of Reid Yellow Dent developed by Clyde Black, Dallas Center, Iowa, and known as Black Yellow Dent. The F2 generation plants of three single crosses, 1198 × M14, 1198 × KB397, and KB397 × Ill. 4226, were selfed and top crossed on each of five plants of U. S. 35 and 10 plants of Black Yellow Dent. The single crosses had been selected for differences in the general

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3Figures in parenthesis refer to “Literature Cited”, p. 57.