ZUBER and Grogan described a technique for measuring stalk strength in corn which gave data highly correlated with field stalk lodging. Lodging-resistant crosses had thicker rinds and stronger stalk sections than lodging-susceptible crosses. The present report evaluates some of the genetic features of the inheritance of crushing strength and rind thickness in a subsequent experiment.

MATERIALS AND METHODS

Inbred lines Mo 940 and Ky 27 are susceptible to stalk lodging, and Mo 22 and T8 are resistant. The two susceptible lines, the 2 resistant lines, the 6 possible F1 single crosses, the 6 F2's, the 12 first-generation, and the 12 second-generation backcrosses among the 4 parents were planted in a randomized complete block in 1957. Each of the 2 replications consisted of 40 entries grouped according to type of cross. These sub-blocks were randomly allocated within replications as were entries within sub-blocks. The 40 entries were planted at the rate of 2 seeds per hill and thinned to 1 plant per hill. Single-row plots contained 30 hills spaced 12 inches apart. However, the F1 and parent entries consisted of 15 hills per plot.

All measurements were made on stalks from mature corn plants. The second internode above the soil level for each plant was dried at 40°C for 1 week before rind-thickness and crushing-strength measurements were determined on 2-inch sections cut with a specially constructed saw. Thickness of rind was measured with a micrometer caliper. The stalk section was crushed with a hydraulic press and the pressure was recorded in pounds.

RESULTS AND DISCUSSION

Crushing strength values appear to be closely associated with rind thickness (Figure 1), in agreement with previous work.

Means for crushing strength and rind thickness substantiated the classification of parental lines into resistant and susceptible groups (Figure 1). R × R crosses gave high values for both traits, and S × S crosses gave low values. The effects of blocking entries according to generation resulted in rather large discrepancies from expected values in several instances. Nevertheless, the mean values provide some insight as to the inheritance of rind thickness and crushing strength in this material.

When arranged according to generations, i.e., with respect to relative genetic contributions of the respective parents, R × R and S × S crosses were nearly symmetrical (see Figure 1). This suggests that the source of resistance (stalk strength) was the same or similar in Mo 22 and T8. Similarly, the genes conferring susceptibility in Mo 940 and Ky 27 may be the same or similar.

The close correspondence between rind-thickness and crushing-strength values may indicate that crushing strength in relatively stalk not free sections is primarily a reflection of rind thickness.

The distributions of parental, F1, and backcross generations in R × S crosses were asymmetrical, skewed in each instance toward the resistant parent (see Figure 1). Prepotence of high stalk strength over low is clearly seen in Figure 2. F1 values were shifted decidedly toward the resistant parent. Figure 2 also indicates that the inbred lines represented poorly the crushing values of their hybrids, except for showing relative rank.

Significant differences among progenies are indicated in analyses of variance for rind thickness and crushing strength (Table 1). Analyses of progenies within generations also indicate highly significant differences among F1, F2, BC1, and BC2 progenies, respectively. Differences among parents were obtained only for rind thickness. Comparisons of parents versus advanced and backcross...