THE COMPARATIVE ROOT DEVELOPMENT OF SELFED LINES OF CORN AND THEIR $F_1$ AND $F_2$ HYBRIDS

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The hybrid vigor of first generation crosses between unrelated self-fertilized lines of corn and its reduction in the second generation is readily apparent and well known with respect to the aerial parts of the plant. The corresponding responses of the root system are more obscure and less understood. It has been the purpose of these investigations to study the extent to which heterosis may be exhibited by the root development of this crop.

DESCRIPTION OF SEED STOCKS

Two standard, homozygous lines of dent corn, Indiana B-2 and Iowa 197, and their $F_1$ and $F_2$ hybrids were studied in 1933 and a corresponding group, Illinois A and Iowa 420, and their $F_1$ and $F_2$ hybrids in 1934. These four lines are well adapted for use in hybrids suitable for eastern Nebraska conditions.

METHODS OF TESTING

Since it was the desire to limit the observations to heritable differences, the various lots were grown comparably each year with the plants spaced individually 7 feet apart in adjacent four-row plats. The tests were located on Carrington silt loam soil at Lincoln, Nebr. The plats were sweep cultivated at sufficient depth merely to destroy weeds without disturbing the main roots of the corn. The climatic conditions were conducive to normal growth in 1933. The rainfall was deficient in 1934 and supplementary irrigation was uniformly applied as needed. The root inspections were made at maturity by the use of technic recently described by Weihing. Detailed observations were limited to the secondary root system since it comprises the bulk of the roots. Because of the large amount of labor involved the root examinations were confined to four plants of each selfed line and hybrid.

VEGETATIVE DIFFERENCES AT MATURITY

The customary aerial differences between selfed lines and their first and second generation hybrids are reflected in Table 1. Although the annual results for both stalks and roots are reported, the averages for the 2 years doubtless serve better to indicate mean expectations. The stalk and root development of representative plants grown in 1934 are shown in a single plane in Fig. 1.

Stalk development.—The $F_1$ hybrids show a material increase in the size of aboveground parts over the inbred parents, while the $F_2$ generation tends to be intermediate. Comparing the selfed lines, the $F_1$ hybrids, and the $F_2$ hybrids with respect to certain characters, their relative stalk heights were 100, 128, and 114; their relative