RELATION BETWEEN NUMBER OF PARENTAL LINES
AND THEORETICAL PERFORMANCE OF SYNTHETIC
VARIETIES OF CORN

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The utilization of hybrid vigor has provided the basis for the more recent improvement in corn. Synthetic varieties of corn have been used only to a very limited extent either commercially or as reservoirs of desirable gene combinations. Synthetic varieties are being used to a limited extent among horticultural crops and among the various forage grasses and legumes. One of the new alfalfa varieties, Ranger, is a composite of five strains resistant to bacterial wilt. Under conditions where the annual production of first generation hybrid seed may be impractical synthetic varieties offer an opportunity to utilize an appreciable amount of hybrid vigor.

The purpose of this study was twofold; first, to investigate the type of gene action involved in the inheritance of various quantitative characters having their visible effects in desirable agronomic performance and second, to investigate the manner in which selected inbred parents may be used to best advantage in the production of synthetic varieties of corn.

Few data are available on the actual performance of synthetic varieties. Hayes (1) reported yields of five synthetic varieties which represented combinations of from 8 to 15 lines. The parental lines involved in each synthetic variety were derived from an individual open-pollinated variety. The percentage increase or decrease in yield for the synthetic as compared with the parental variety ranged from -11.7 to +16.6.

Sprague and Jenkins (8) reported data on the acre yields of the F1, F2, F3, and F4 generations of four 16-line and one 24-line synthetics and of several open-pollinated varieties. In general, the average yield of the advanced generations closely approximated the average yield of the open-pollinated varieties with which they were compared. The inbred lines involved in these hybrids were chosen for specific characteristics other than combining ability, hence the yields of these synthetics may not be representative of the yields to be expected with adequate selection for combining ability.

Yields of the F1 and F2 generations of 8- and 16-line synthetics were reported by Kiesselbach (5). Concerning synthetic varieties in general, he states, "The Nebraska Experiment Station has had a number as productive as ordinary varieties but no better."

1 Contribution from Farm Crops Subsection, Iowa Agricultural Experiment Station, Ames, Iowa, and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Dept. of Agriculture, cooperating. Journal paper J-1254, Project 163. Received for publication January 19, 1945.

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3 Figures in parenthesis refer to "Literature Cited", p. 350.