THE SEGREGATION OF GENES AFFECTING YIELD PRE-
POTENCY, LODGING, AND DISEASE RESISTANCE
IN F₃ AND F₄ LINES OF CORN¹

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The development of hybrid corn is one of the very striking illus-
trations of the contributions of research to practical agriculture.
In Iowa in 1932, for example, approximately 4,000 acres were planted
to hybrid corn, while in 1939 the hybrid corn acreage was approxi-
mately 7,500,000 acres. This is nearly a 2,000 fold increase during a
seven-year period. In addition to the increased acreage grown, there
has been, also, a considerable improvement in the hybrids offered for
sale during this period.

In the final analysis the value of hybrid corn to the farmer is based
on the inbred lines available for use. The development of methods
which will make for a more efficient production or evaluation of new
inbred lines will eventually be of benefit to the hybrid corn industry
and the farmer who uses hybrid seed.

In 1935, Jenkins (1)³ presented data indicating that inbred lines
exhibited their hybrid combining potentialities very early in the in-
breeding process and that the combining ability was not materially
affected by selection in later generations. This somewhat unexpected
finding was explained, "on the basis that yield was controlled by a
large number of dominant genes, many of which have approximately
equal effects. Essentially equal numbers of dominant alleles will be
preserved by chance through the successive generations of selfing
even though accompanied by segregation for particular dominant
alleles."

More recently, additional data have been presented by Jenkins (2)
dealing with segregation of genes affecting yield of grain. A yield
test was conducted comparing the top cross performance of 16 siblings
among each of seven S₁ plants of the variety Krug. On the basis of
the variation among sibling plants within lines, theoretical mean
square values were calculated for successive generations of selfing.
These values indicated that, theoretically, it would be possible to
detect segregation for yield factors in the S₇ generation. Practical
considerations, however, indicated the importance of testing lines
for yield prepotency earlier in the course of inbreeding.

The investigations reported here were undertaken to furnish addi-
tional evidence on the segregation of genes for yield prepotency, lodg-
ing and disease resistance in the F₃ and F₄ generations of inbreeding.

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³Figures in parenthesis refer to "Literature Cited," p. 214.