

DIALLEL ANALYSIS OF RATE AND DURATION OF GRAIN FILL  
AND OTHER AGRONOMIC TRAITS IN EIGHT INBRED LINES OF MAIZE  
(Zea mays L.)

by

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Under the supervision of Professor Paul N. Drolsom

ABSTRACT

Fifty-six crosses (including reciprocals) and their eight inbred parents were grown to determine if there was genetic variation in the rate and duration of grain filling and other agronomic traits. The nature of gene control, reciprocal effects, environmental influences, and the relationships among these traits also were studied.  $F_1$ 's and reciprocal crosses were grown at two locations for two years in a randomized complete block design with three replications at each location.

Significant differences existed for rate of fill, grain moisture percentage, yield, actual filling period duration (AFPD), plant and ear height, days to silk, row number, kernel number, ear length and circumference among inbreds and hybrids. There were also significant differences in lag period and effective filling period duration (EFPD) among hybrids but not among inbreds. Grain yield was positively correlated with rate and duration of grain fill. Hybrids had longer lag periods, higher rates of fill, yield, ear and plant

height, and lower grain moisture than the average of their parents. EFPD varied considerably among hybrids in comparison with mid-parent values. Hybrids generally flowered earlier, had more rows ear<sup>-1</sup>, kernels row<sup>-1</sup>, heavier kernels and longer AFPD than their inbred parents. In most cases, reciprocal effects were not significant. Year, location, genotype, first- and second-order interaction components were important for all traits except ear circumference.

General combining ability (GCA) effects were highly significant for the rate of fill, yield, AFPD, rows ear<sup>-1</sup>, and plant height. GCA effects were more important than specific combining ability (SCA) effects for EFPD. Both GCA and SCA effects were important for lag period. SCA effects were highly significant for grain moisture and kernel weight. Reciprocal maternal and non-maternal effects were not significant for most traits.

EFPD may be directly or indirectly related to grain yield. Rate of fill was limiting for the material studied. There was considerable variability for most traits, except EFPD. Environmental influences were important in the expression of these traits. Most traits were under additive genetic control and hence selection should be beneficial. However, fast screening methods need to be developed especially for rate, EFPD and lag period.

Approved: \_\_\_\_\_

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