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Testcross performance of Doubled Haploids versus S2, S4, and S6 selfing generation in a maize population for the subtropics in México

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ABSTRACT

Maize (*Zea mays*) hybrid breeding programs are increasingly using Double Haploid (DH) technology; however, in developing countries like in the subtropics, its use is still limited. DH is considered to provide 100% homozygous lines faster than the pedigree selfing method, and since production costs are presumably decreasing, it would be necessary to consider incorporating this technology into new and established breeding programs in these countries. This investigation starts with an S1 population from the same heterotic group the belongs to the CIMMYT Genebank, and it was divided into three parts. First, it describes the DH process, then the pedigree selfing method is evaluated for early generation testing, and finally, there was a comparison of both methodologies through a line by tester evaluation. The testcross performance of 15 DH lines and 14 lines from each of the S2, S4, and S6 selfing generation were tested in multilocation yield trials in the subtropics region of Mexico. It would take three years from the S1 population to identify the DH 100% homozygous lines with highest GCA, one year before the S6 lines (98.4% homozygous). For this data set, early generation testing was not found appropriate due to low correlation values. The DH lines reviled to have more GxE interactions than S2 testcrosses and the same heritability than the S6. There was no difference between the S2 evaluations; however, there were statistical differences found with the S4 and the S6 testcrosses. Thus, the DH technology could be implemented gradually in hybrid breeding programs, but the pedigree method should not be abandoned just yet, and testing in selfing generations should be done in S6.

Key words

Double haploid, hybrid maize breeding, early generation testing.

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EQUATIONS

NOMENCLATURE

AMMI	Additive main effects and multiplicative interaction
ANOVA	Analysis of variance
ASI	Anthesis to Silking Interval
CIMMYT	International Maize and Wheat Improvement Center
CV	Coefficient of Variation
DH	Double haploid
EV-TC	Evaluation of a Testcross
FAO	Food and Agriculture Organization
GCA	General combining ability
GxE	Genotype by environment interactions
MARS	Marker assisted recurrent selection
OPVs	Open-pollinated varieties
QPM	Quality protein maize
R1-nj	R1-navajo
REML	Restricted maximum likelihood
S2di	Deviations from the regression
SAM	Shoot apical meristem
SCA	Specific combining ability
SL	Selfing generation line
SS	Sum of squares
TC	Testcross formation
USA- US	United States of America
USDA	The United States Department of Agriculture

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