Evaluation of some new inbred lines of maize (zea mays, l.)

Mohamed Elamin Mohamed El-kielany

The main objective of the present work was to evaluate some new inbred lines of maize through line x tester analysis. Thirty eightnew inbreds were isolated from different sources until 56 stage ofinbreeding. In 1995 season, the inbred lines were topcrossed to eachof three testers of different genetic base namely, Giza- 2 (broad geneticbase), S.C. 10 (mediwn genetic base) and inbred lineM 13 (narrowgenetic base. The resultant 114 top crosses along with two checks(Giza- 2 and S.C. 10) were evaluated in 1996 and 1997 seasons in arandomized complete block design using three replications. Data wererecorded for days to 50 % tasseling, days to 50 % silking, plant height,ear height, ear length, ear diameter, number of rows/ ear, number ofkernels/ row, 100- kernel weight and grain yield! plant. Line x testeranalysis according to Kempthorne (1957) was practiced for thecombined data of two years.The results of the present study combined over two years couldbe summarized as follows:1- The inbred line M 1 was the best among all studied lines forsilking date and plant height. Since it expressed the mostdesirable effects over all top crosses as compared with the checkvariety S.C. 10. Also, this line ranked the second best fornumber of kernels! row and ranked the third best for ear heightand grain yield! plant. Inbred line M 5 was the best for earlength, while inbred M 27 was the best for ear length and grainyield! plant and ranked the third best for number of grains! row.Inbred M 35 was the second best for tasseling and silking datesand number of grains/ row. Inbred M 36 ranked the first best fornumber of grains/ row and grain yield! plant, the second best for100- kernel weight and the fourth best for silking date and fornumber of rows/ ear. Inbred M 38 was the first best for eardiameter, number of rows/ ear and 100- kernel weight and rankedthe third best for ear length.2- The best top crosses were M 7 x Giza- 2, M 15 x Giza- 2 andM 18 x M 13 for date of tasseling, MIx Giza- 2, M 35 x Giza-2 and MIx S.C. 10 for date of silking, Giza-2 with each ofMI,M 2 and M 3 for plant height, M 2 x Giza- 2, M 30 x Giza- 2 andM 30 x M 13 for ear height, M 5 x Giza- 2, M 4 x M 13 and M 8x M 13 for ear length, M 5 x Giza- 2, M 8 x S.C. to and M 38 xM 13 for ear diameter, S.C. 10 with each ofM 27, M 1,M 8 andM 35 for number of rows! ear, M 24 x Giza- 2, M 7 x S.C. 10and M 36 with each of Giza- 2 and S.C. 10 for number ofgrains/ row, M 37 x Giza- 2, M 38 x Giza- 2 and M 38 x S.C. 10for 100 kernel weight and M 36 x Giza- 2, M 36 with each ofS.C. 10 and M 13, M 32 x S.C. 10 and M 27 x S.C. 10 for grainyield! plant.3~ The highest correlation coefficients were detected for the testerS.C. 10 and multiple tester for date oftassclina, and silking, eardiameter, number of rowl ear, 100- kernel weight and grainyield! plant revealing the desirability of the tester S.C. 10 ascompared with the other testers.4- Correlation values between the two testers S.C. 10 and M 13reached maximwn values for date of tasseling, ear diameter, 100kernel weight and grain yield! plant, confirming the superiorityof the two testers in this study.5- Rank correlation estimates with the multiple tester showed thatthe tester Giza- 2 was the best for date tasseling and silking,plant height, ear length and number or rows! ear. The tester S.C.10 was the best for evaluating ear diameter and grain yield! plant,whereas the tester M 13 was the best for the evaluation of earheight, number of kernels! row and 100- kernel weight.6- The highest correlation values between ranks of each two testerswere detected between Giza -2 and S.C. 10 for ear diameter,number of rows! ear and grain yield! plant; between Giza- 2 andM 13 for plant height, ear height, ear length and number ofkernels! row; and between S.C. 10 and M 13 for number of daysto 50% siIking and 100- kernel weight.7- Significant mean squares due to crosses along with

lines andtesters were detected for all studied traits except that of testermean squares for ear diameter. Significant line x testerinteraction mean squares were obtained for all traits except plantheight, ear height, ear length, number of rows! ear and 100-kernel weight revealing that the parental lines performeddifferently according to the tester to which it crossed. Significantinteraction between each of lines and testers with years were.detected for most traits, indicating that both inbreds and testersbehaved somewhat differently from one year to another.Significant tester x line x year mean squares were detected fordate of tasseling and silking, number of kernel! row and grainyield! plant, revealing the hybrids between testers and linesresponded differently to growing seasons8- Variance component estimates for GCA were appreciably largerthan those for SeA effects for most traits, revealing that thelargest part of the total genetic variability was a result of additivegene effects.9- The magnitude of the interaction between seA and years wasmuch higher than that of GCA x year for date of tasseling, earheight, ear length, number of kernels/ row and grain Yield! plant.This result indicated that non- additive gene action was morebiased by the interaction with environment the additive effects.10- The inbred lines showing the best desirable GCA effects wereM 1, M 18 and M 30 and M 35 for date of'tasseling, M 1, M 18,M 35 and M 36 for date of silking, M 1, M2, M3 and M 30 forplant height, M 1,M 2, M 27 and M 30 for ear height, M 5, M 6,M 3] and M 38 for ear length, M 17, M 27, M 31 and M 38 forear diameter, M I, M 35, M 36 and M 38 for number or rows!ear and number of kernels/row, M 27, M 35, M 36 andM 38- 89-for 100- kernel weight andM 1, M5, M 27, M 35 andM 36 forgrain yield! plant.11- The tester Giza- 2 expressed significant and negative GCAeffects for number of date of tasseling and silking, plant height,and ear height. Parental tester S.C. 10 was the best generalcombiner for ear length, ear diameter, number ofkemels/ row,100 kernel weight and grain yield! plant. The tester M 13 wasthe best combiner for number of rows/ ear. Such resultindicated that the tester S.C. 10 was the best combiner for grainyield and most of its components.12- The most desirable SCA effects were exhibited in the topcrosses M 15 x Giza- 2, M 31 x M 13 andM 7 x S.C. 10 for datetasseling, M 31 x M 13, MIx S.C. 10 andM 8 x S.C. 10 fordate of silking,M 36 x S.C. 10,M 18 x S.C. 10 andM 5 x Giza-2 then M 17 x M 13 for plant height;M18 x S.C. 10,M 13 xM31 and M15 x S.C. 10 for ear height,M 4 x S.C. 10,M 8 x S.C.10 andM 5 x Giza-2 for ear length,M 23 x Giza- 2, M 8 x S.C.10 and M 38 x M 13 for ear diameter,M 19 x M 13,M 17 xM13 andM 27 x S.C. 10 for number of rows! ear, M 24 x Giza- 2,M 3 x S.C. 10 andM 7 x S.C. 10 for number of kernels! row, M11 x S.C. 10, M 19 x Giza-2 andM 20 x Giza. 2 for 100-kernel weight and M 4 x S.C. 10,M 22 x Giza- 2, M 13 x S.C.10, M 14 x S.C. 10 and M 32 x S.C. 10 for grain yield! plant.13- The discriminating power of the tester based on the range in SCAeffect between the testcross, number of significant SCA effectsand the highest favorable SCA effect revealed that, for date oftasseling, the tester Giza- 2 expressed the highest number ofdesirable SCA effect and showed the highest negative SeA effect, while the tester M 13 exhibited the widest range of SCA effects. For date of::silking and number of rows! ear, the besttester in the three estimates was M 13. For plant height, earheight, ear length, and 100- kernel weight, the best tester wasS.C. 10 in at least two estimates. For ear diameter and number ofgrains/ row the best tester was Giza- 2. For grain yield/plant, thetester S.C. 10 expressed the highest desirable SCA whereas thetester Giza- 2 exhibited the widest range between seA effects.14- The most desirable heterotic effects for grain yield! plant relativeto the check Giza- 2 were recorded for the top crosses M 36 xS.C. 10 (40.86%), M 32 x S.C. 10 (39.68%), M 27 x S.C. 10(39.57%), M 36 x M 13 (39.04 %) and M 13 x S.C. 10(31.34%). whereas, the best heterosis values relative to S.C. 10were detected for the top crosses M 36 x S.C. 10 (25.91%),M 36 x Giza- 2 (25.05 %), M 32 x S.C. 10 (24.86%), M 27 xS.C. 10 (24.76%) and M 36 xM 13 (24.28%). Therefore, thesecrosses are prospective in maize breeding programs.