Breeding studies on maize (zea mays,l)

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The aim of this investigation was to detennine the extent ofheterosis and combining ability and their interaction with seasons(environments) for growth and yield characteristics i.e. tasseling andsilking dates, ear and plant heights, leaf area, leaf angle, ear husk, stemdiameter, number of ears per plant, ear length, ear diameter, number ofrows per ear, number of kernels per row, 100- kernel weight, shellingpercentage and grain yield per plant.To achieve this target Fl and F2 of the half dialle cross betweeneight inbred lines namely Moshtohor 101H,M 105g,M 110M,M 72,M 27, M 70B, M 106i andM 36 representing wide range of variabilityin most of the studied traits.In 1994 season, crossing was made with all possiblecombinations among the eight parental inbred lines without thereciprocals and evaluated in 1995 season with three check varieties(including single cross 10, three way cross 310 and Giza 2) in arandomized complete block design with three replications. In 1996season, two adjacent experiments were conducted the first involvedthe parental inbred lines and their twenty eight possible crosses andthree check varieties, and the second included the parents and the F2crosses.Data were recorded on F1 using 10- plant per plot. However,on F2 a 40-plant samplel plot was used. The data obtained for eachtrait were analysed on individual plant mean bases. The ordinaryanalysis of variance was firstly performed. Heterosis was computed asthe percentage deviation of F1 mean performance from the mid- parent,better parent and check variety average values for individual crosses.General and specific combining ability estimates were obtained byemploying Griffing’s (1956) diallel cross analysis designed asmethod 2 model 1. The obtained results can be summarized asfollows :A- F) generation:1- Season mean squares were significant for all traits.2- Significant genotypes mean squares were detected for all traits inseparate season as well as the combined analysis except for eardiameter in the second season. Significant genotypes by seasoninteraction mean squares were detected for all traits exceptnumber of rows/ ear.3- Significant inbred lines mean squares were showed in all traitsexcept number of eats per plant, and 100- kernel weight in bothseasons as well as the combined analysis, number of kernels perrow, shelling percentage, leaf angle and ear husk in the first”season, ear height, tasseling date and stem diameter in the secondseason. Insignificant mean squares of interaction betweenparental inbred lines and seasons were detected for all traitsexcept silking date, stem diameter and ear husk.4- The parental inbred line 27 and lOIH behaved as the earliestinbreds in both seasons as well as the combined analysis.5- The parental inbred lines 70B gave the lowest mean values forear and plant height in both seasons. However, the parentalinbred line 1108 had the highest mean values for both traits. The . .•.parental inbred line 101H had the highest mean value for leafarea.6- The parental inbred lines 110B, 72 and 36 recorded heavier 100-kernel weight. While the parental inbred lines 1lOB, 27 and I05ggave the highest shelling percentage. The parental inbred linesII0b was the first in gain yield per plant, while the inbred line101H was the second one for this trait.7- Crosses mean squares were significant for all cases exceptnumber of rows per ear in the second season and the combinedanalysis, number of kernels per row, ear length, ear diameter,stem diameter and tasseling date in the combined analysis.8- Significant interaction between FI hybrids and seasons weredetected for all traits except number of rows/ ear.9- The crosses 10IH x 72, 72 x 27 and 27 x 10IH had the earliness,while the crosses 11OBx 105g and 105g x 106i exhibited shortplant. Also, the crosses 1lOB x 70 B , I lOB x 101H, IIOB x 36and 105g x I06i gave the lowest mean values of ear height. Thehighest values for leaf area were recorded by crosses 110B x 72,IIOB x 70B, 1108 x 106i, 72 x 70B, 72 x 106i, 27 x 101H, 27 x70B, 27 x 36,101 Hx 70B, 101 Hx 105g and l05g x 106i in

thecombined analysis The best crosses for leaf angle were 27 x 36, and 36 x 106i.10- For grain yield per plant, six hybrids lOIH x 106i, 10lH x 105g,27 x 105gm 110B x 105g, IIOB x 10lH and 110B x 27 hadsignificant superiority over the check varieties in the firstseason. None of the hybrids had significant superiority over thecheck varieties in the second season. In the combined analysis,the two crosses (110B x 101H) and 10lH x 106i had significantsuperiority over the check varieties.11- Mean squares for parents vs crosses were significant for all traitsexcept 100- kernel weight in both seasons as well as thecombined analysis, and stem diameter and shelling percentage inthe second and first season, respectively.12- Insignificant interaction mean squares between parents vs crossesand season were detected for all traits except for ear diameter ,tasseling date, silking date, ear husk and grain yield per plant.For grain yield per plant, all crosses significantly exceeded out ofrespective mid- parent or better parent in each season as well asthe combined analysis.13- The three crosses 110B x 101H, IOIH xl05g and IOIH x 106iout yielded the check variety S.C. 10 by 14.34% in the combinedanalysis. It could be concluded that these crosses offer possibilityfor improving grain yield of maize.14- The results showed that the best productions of double crosseswere (110B x 10IH)(l06i x 105g), (110B x 70B)(l01H x 10,5g),(lOIH x 110B)(105g x 106i), (lOIH x 110B)(106i x 105g), (70Bx 10IH)(l05g x 110B), (lOlH x 110B)(70B x 106i), (lOIH x101B)(106i x 27), (110B x 101H)(27 x 105g), (27 x 70B)(l05g x110B) and (119B x 36)(105g x lOIH) . These double crossesexhibited high performance and out yielded the check varieties.2- Combining ability:1- The mean squares associated with general combining ability(GCA) were significant for all traits except ear length in thesecond season, number of ears per plant, leaf angle and ear huskin the first season, and number of ears per plant, number ofkernels per row and ear diameter in the combined analysis.2- Specific combining ability (SeA) variances were found to besignificant for all characters under study.3- Non additive type of gene action was more important part of thetotal genetic variability for ear length in the second season, .number or ears per plant, leaf angle and ear husk in the firstseason, and number of ears per plant, number ’or kernels per rowand ear diameter in the combined analysis.4- Low GCAl SeA ratios of less than unity were detected for grainyield per plant in number .of rows per ear, ear length in bothseasons as well as the combined analysis. Plant height, earheight, leaf area and number of kernels per row in both seasons,number of ears per plant, leaf angle and ear husk in the secondseason, ear length, ear diameter, tasseling date, silking date inthe first season, and ear length, tasseling date and ear husk in thecombined analysis. However, high GCA/ SeA ratios whichexceeded the unity were detected for 100- kernel weigh in bothseasons and the combined analysis, shelling percentage in bothseasons, silking date in the second season as well as thecombined analysis, stem diameter in the first season as well asthe combined analysis. And tasseling date in the second season.5- Mean squares of interaction between season and generalcombining ability were significant for ear diameter, silking dateand grain yield per plant. However, significant mean squares ofinteraction between SCA and season were detected for all traitsunder study except stem diameter, number of rows per ear,number ofkemels per row and 100- kernel weight.6- The best combiners parental inbred lines were Moshtohor 106i,and 27 for earliness, parental inbred lines M 72, M 70B, and MI06i for plant height and parental inbred lines IOlH and Il0Bfor grain yield and some of its attributes.7- The two crosses 110B x l06i and 10IH x 36 expressedsignificant negative Sij effects for silking and tasseling dates.Also, ten crosses: 1l0B x 27, llOB x 101H, 72 x 27, 27 x 70B,10lH x 70B, 101 H x 105g, 10lH x 106i, 70B x 105g, 105 g x 36and 36 x I06i appeared to be the promising crosses for breedingtowards high yielding potentiality.- 117-B- F2 generation:1- Mean squares for genotypes were significant for al the studiedtraits except number of ears per plant. Meanwhile, parents meansquares were significant for all traits except 100- kernel weightand ear diameter. Also, hybrid mean squares were significantfor all traits except number of rows per ear and number ofkernels per row.2- Non of the F1 hybrids surpassed the better check variety for allhybrids except 100- kernel weight, plant and ear heights.3- Nineteen, twenty two, twenty seven, twenty six, twenty three,twenty three, twenty ,thirteen, nine and twenty seven hybridsexhibited significant positive inbreeding depression percentagefor stem diameter, ear diameter, ear length, ear husk, number ofrowsl ear, number of kernels per row, 100 kernel weigh, shellingpercentage and grain yield, respectively.4- General and specific combining ability mean squares weresignificant for all traits except GCA for

100 kernel weight and<.seA for tasseling date. The similar trend was obtained form F2data with the analysis of FI data.5- The results obtained from F2 data for general an specificcombining ability effects were coincided with that alreadyreached from combining ability effects derived from FIgeneration, for most cases.Association study :1- Significant positive phenotypic correlation coefficients valueswere detected between grain yield and each of number of earsper plant, number of rows per ear, number ofkemels per row andplant height in both seasons as well as the combined analysis.Also, significant positive phenotypic correlation values weredetected between grain yield and leaf area in the first season andthe combined analysis.2- Number of rows per ear had a high and positive direct effect onyield by a value of 0.40, 0.412, and 0.0153 in the first, secondseasons and the combined analysis, respectively. Also, itsindirect effects are important through number of kernels per rowin the first season and the combined analysis. While, otherindirect effect was not important.3- In the first season, the direct effect of the four traits; number ofrows per ear, number of kernels per row, leaf area and plantheight accounted for approximately 61.54%. While, the directeffect for number of rows per ear and plant height accounted forapproximately 35.41% in the second season. Moreover, thedirect effect of number of ears per plant, number ofkemels perrow and leaf area accounted for approximately 33.01% in thecombined analysis.