Seed quality properties of some maize varieties in relation to yield under water stress conditions

Alaaeldin Mohamed El-galfy

This study inclouded two main topics :First topic: Effect of the respones of growth, yield and yield componentsof some maize varieties in ~elation to yield under different soilwater stress conditions.Second topic : Testing seed qualityfor original seed and producedgrams.First topic : Two field experiments were conducted at the research andexperimental station of Faculty of Agriculture at Moshtohor, KalubiaGovernorate, Egypt during 1997-1998 and 1998-1999 seasons. The targetof these experiments is to find out the effect of the respones of growth,yield and yield components of some maize varieties in relation to yieldunder different soil water stress conditions:The expermintal design was split plot with four replications.Irrigation treatments were randomly assigned in the main plots, whereasmaize varieties were allocated at random in the sub plots. The area ofeach experimental plot was 16.8m2which consisted of 8 ridges of 70 emapart and 3 meters length.Treatments were applied as follows:A: Irrigation treatments: Irrigation at 40% Avialble Soil MoistureDepltion (ASMD); Irrigation at 600/0 ASMD and Irrigation at80%ASMD.B: Maize varieties: Single cross 10 (S.C.10); Three way cross 310(T.W.C.310);Giza 2(an open-pollinated cv.); Single Cross 152 (8.C.152),Yellow cv.t'Ihree way cross 352 (T.W.C. 352), Yellow cv.The effect of the applied treatment on the studied parameter can besammarized as follows:1- There was significant decreased number of days to 500/0tasseling andsilking by increasing availble soil moisture depletion from 40 to 60 andup to 800/0. Earlier tasseling and silking were observed when maizeplants were irrigated at 80% .~vailble Soil Moisture Depltion.2-Giza 2 was of the earliest variety and S.C.152 was the latest one IIIreaching 50% tasseling and silking in the two growingseasons.However, differences between the other varieties (T.W.C.310,T.W.C. 352 and S.C.I0) were almost ignorable in both of the studiedtraits. 3- Interaction effect of soil water stress and grwon maize varieties on tasseling and silking was significant in the two seasons. Giza 2cvwasthe earliest in tasseling and silking as compared with othervarieties under the modrate (600/0)and/or the higher (800/0)soil waterstress.4- Increasing Availble Soil Moisture Depltion caused significant decreasedin the height of maize plants. Shortest plants were produced at thesevere soil water stress (800/0 ASMD), whereas tallest plants wereproduced at the lowest avilble soil moisture depletion of 40%.5- Maize plant height was extennely related to each of the grown varietieswith various significant differences in the two grown seasons. Thevariety S.C.10 was the tallest plants which was 298.0 and 281.7 emand Giza 2 was the shortest plants of267.8 and 235.3 ern in the two13-Dry matter accumulation was enhanced and increased as the avilablesoil water decreased from 80 to 60 down to 40% ASMD.Therespective reduction in dry matter accumulationfor leaves, stems andears were about 30,26% and25% for the first season, being 23.0%,20.00/0and 20.0% for the second season.14- Maize variety SC10 produce the highest dry matter accumulation for .leaves, stems and ears as compared with other varieties.15-The highest dry matter accumualation for leaves, stems and ears wasproduced ofS.C.lO cv at 40% ASMD whereas the lowest dry matteraccumulation for the studied parameter was noticed for Giza 2 cv at80%ASMD .16- Ear weight was significantlyeffected by the applied soil water stress.As the ASMD increased from 40 to 60 and up to 80.0%, ear weightwas continously and significantly decreased. This result was true forthe two seasons.17- Heaviest ear weight was produced from the variety S.C. 10 ascompared with other ones with significant differences in the twogrowing seasons.Ear weight of such variety was

253.6 and 217.8g inthe first and second season, respectively.18-The interaction effect of varieties under different soil water stress onear weight was significant.Heaviest ear weight was obtained forS.C.I0 variety under soil moisture depletion of 40%. whereas, thelowest ear weight was obtained from S.C 152 variety at 80% ASMD.19-5horter ears were produced as the soil water stress increased.AtASMD of 40, 60 and 80% the respective ear length was 18.4, 17.4and 16.6 cm in the first season; and 17.7, 17.3 and 16.1 in thesecond season. .maize varietiesS.C.I0 and T.W.C. 310 were of the tallest ears withsignificant differences as compared with the other varieties andinsignificant differences among themselves.21- Maize varieties S.C.I0 and T.W.C. 310 cvs produced the longest earsat 40% ASMD. whereas, TWC 352 cv produced the shortest ears at600/0and 800/0ASMD in the first and second seasons, respectively.22- As ASMD increased from 40 to 6C and up 80% ear diamter wassignificantly decreased.23-Maize variety T.W.C.352 produced the thickest ears in the first season,whereas, either T.W.C. 352 and lor S.C. 10 produced the thickest earsin the second season.24.At the 400/0ASMD , T.W.C352 cv was of the thickest ears. Moreover,the thinest ears were produced for S.C.152 cv at the sever ASMD(800/0).25-Number of rows/ear was insignificantly affected by the appliedASMD's (40,60 and 80%) in the two grown seasons.26- Maize variety T.W.C. 352 was of the highest number of rows/earfollowed byS.C. 152 cv for the first and second season with significantdifferences.Moreover, the variety S.C. 10 was of the lowest number ofrow/ear for the two growing seasons.27- The interaction effect of grown maize varieties under different soilstress on number of rows/ear was insignificant.28-As the ASMD increased from 40 to 60 and up to 800/0number ofgrains/row decreased. However, the differences in number ofgrains/row was insignificant between the lower (40) and medium(600/0)ASMD for the second season.29- Maize varieties S.C.I0 and T.W.C. 310 cvs were of the heighestnumber of grainslear in the first season with significant differencesamong the other varieties. whereas, in the second season only S.C.I0was of significantly higher in number of grains/row as compared withthe remained varieties.30- Maize varieties was significant. The variety S.C.I0 at 40% AS1IDwas ruperior in number of grains/row as compared with the othervarieties.31- Grair: weight/ear was significantly decreased as ASrvID ircreased from40 to 60 and up to 80%.32- Heaviest grain weight/ear was produced from S.C.lO cv, followed by1. W.C. 310 cv with significant differences in the two seasons. Theremained three varieties (T.W.C352, T.W.C.310 and GIza 2) were ofno significant differences in their grain weight/ear.33- There was significant interaction effect of applied ASMD on grainweight/ear for the grown maize varieties. The variety S.C.lO cv wasof the heaviest grain weight/ear at 400/0ASMD, whereas S.C.152 and1.W.C. 352 cvs were of the lightest grain weight/ear at 800/0ASMD.34- The applied ASMD's significantly decreased the 100-grain weight ofmaize. The lowest ASrvID'S (40%) produced the heaviest grains,whereas the medium ASMD (60%) caused 7% reduction in grainweight. Meanwhile, the greatest reduction was obtained whencomparing between the lowest (40%) and the highest (800/0)ASMDwhich was about 11.0 and 15.0% in the first and second growingseasons, respectively with significant differences.35-Maize variety S.C. 10 was superior in producing the heaviest grainweight as compared with the other grown varieties for the two seasonswith significant differences.On the other hand, S.C. 152 variety provedto be of the lightest 100 grain weight as compared with the othervarieties (T.W.C.31 0, T.W.C.352 and Giza 2) for the two seasons.36-The variety S.C.lO produced hieghest 1Ofl-grain'weight at any of theapplied ASMD'S. Meanwhile, S.C.152 variety produced the lightestgrain weight at the highest ASrvID (800/0)as compared with the othervarieties in the two growing seasons.37- Grain yield was reduced to 44.00/0and 48.0% in the first and secondseasons, respectively, as the soil moisture status reduced from 40 to800/0 ASMf)'s. Moreover as the ASMD increased from 40 to 50 andfrom 60 to 80 %, the respective reduction in grain yield was 25.0%and 24.60/0 in the first season, being 29.0 and 27.0°,4 in the secondseason with significant differences.38- Maize variety S.C. 10 was the highest grain yield and S.C. 152 was ofthe lowest one in the two growing seasons. The differences among allof the grown varieties were significant in the second season.whereas.in the second season there were no significant differences ingrain yield between T.W.C.352, T.W.C. 310 and Giza 2 cvs as well asbetween T.W.C. 310, Giza 2 and S.C.152 cvs.39- There was significant interaction between maize varieties and theapplied Availble Soil Moisture Depletion on grain yield. The heighestgrain yield was produced from S.C. 10 cv at 400/0AS~ and thelowest grain yield obtained from S.C. 152

cvat 80.00/0AS~ in thefirst and second grown seasons.. 40- Crude protein yield increased as ASMD increased from 40 to 60 andup to 80 % in the two seasons ..41-Maize varieties S.C.10 and T.W.C. 352 were of the heighest proteinyield in the first and second season, respectively. Meanwhile thevariety S.C.152 was of the lowest protein yield in the two seasons.42- Total carbohydrate and oil production decreased continously as theASMD increased from 40.0 to 60.0 and up to 80.0%.43- Maize variety S.C.I0 was produced the heighest total carbohydrateand oil production~ Meanwhile S.C. 152 was of the lowest totalcarbohydrate and oil production in the two growing seasons.Second topic:Testing seed quality for the orignal seed and produced grainsinclouded the following:Gennination test, seedling emergance, proteinfraction and isozyme electrophoresis of estrase (Est) a.id Perioxdase (Px).Results could be summarized as follows : - 1- Seed germination test for the selected maize varieties was within theacceptable range (> 80 %) ..2- The germination percentage was not much affected by the increase inthe moisture tension from -5 to -10 atm. This also indicate that theselected varieties are more promissing for the target of the prop sedfield of study.3- The increase in the level of moisture stress from -5 attn to -10 attndecreased plumule length stress index from 87.90/0to 34.0%.4- Highest plumule length stress index was 71.5% in Giza 2 and the lowestvalue was 51.7% for S.C.lO.5- Increasing water stress from -5 to -10 attn decreased radical lengthstress indices.6- The radical length stress index ranged from 58.90/0for T.W.C.352 cv to31.5% for S,C.IO cv.7- Increasing water stress index from -5 to -10 attn decreased dry matterstress index from 72.2% to 46.2%.8- Dry matter of seedling stress index ranged from 73.9% for S.C.I52 to36.9% for T.W.C. 310 cv.9- The number and location of bands on the molecular weight scale as wellas the percentage of proteins varied according to the grown maizevarieties and the induced ASMD’s.10- The obtained molecular weight of proteins was ranged from 554.500to 26.636 Kd.11- Electrophoretic bands of estrase for S.C.I0 and T.W.l(.310 cvs were6 whereas for such enzyme S.C.152 and T.W.C. 35:’, cvs contained4 bands while Giza 2 contained 5 bands. Moreover, such bandnumber was varied according to the expoced to water stress.12-Each maize variety containe four protein bands ofperoxodase exceptT.W.C.310 cv which had five bands for such inzyme, Exposing maizevarieties to soil water stress of 40, 60 and 80% ASMD lead to achange in number of protein bands and its Rr values.