scheduling irrigation of maize by using the evaporation pan methods

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Two field experiments were conducted at the field of the Agric. Administration of Shebeen El-Kanater District, Kalubia Governorate, Egypt in 1997 and 1998 seasons.The aim of the experiments was to study the effects of scheduling irrigation of maize according to the Class ”A” Pan Evaporation recordes under three planting dates (May 15, June 1 and June 15), three irrigation regimes (at 1.3, 1.0 and 0.7 accumulative Pan Evaportion) and two maize cultivars (S.C.10 and T.W.C.310) on growth, yield and its components, grain quality characters and water relations of the crop.The experiments were carried out in a clay loamy soil. The design of the experiments was split-split plot with four replications. Main plots were devoted for planting dates, the sub-plots for irrigation regimes and sub-sub plots to maize cultivars. The sub-sub plot area was 42 m2.All cultural practices for growing maize were carried out as recommended for the region. The irrigation treatments were applied after the first irrigation till the end of the growing season. The first irrigation was applied 20 days from planting in allregimes.Results could be summarized as follows: I. Growth characters:1- Planting maize on first June increased plant height, ear height, leaves number/plant, ear diameter, area of topmost ear leaf, leaves dry weight % per plant, stem dry weight % per plant, and dry weight of plant at 90 days from planting.The increases were significant with ear height, number of leaves/plant, area of topmost ear leaf, leaves dry weight % /plant, and dry weight of plant in the first season and with stem dry weight % per plant and dry weight/ plant in the second season.2-All growth characters of maize plant measured at 90 days from planting recorded higher values when irrigation was scheduled at 1.3 accumulative pan evaporation rate (APE) in both seasons, compared with irrigation at 1.0 and 0.7 (APE). The increases in growth characters were almost significant.3-Growth characters of S.C.10 measured at 90 days from planting recorded higher values compared with T.W.C.310. Differences between the two hybrids were almost significant in 1997 season.4-Interaction between planting dates and cultivars significantly affected number of leaves/plant at 90 days from planting.H. Yield and its components:1- Grain yield/fed of maize produced from 1st June planting surpassed that produced from either 15th May or 15th June planting in both seasons.. The differences were almost significant. In 1997 season, the early planting significantly surpassed the late planting. First June planting outyielded 15th May planting by 9.2 and 22.5% in 1997 and 1998 season, respectively. Also, first June planting outyielded 15th June planting by 28.5 and 23.5% in the first and second season, respectively.2-First June planting recorded higher values in ear length (in 1997), ear diameter (in 1998), number of grains/row (in 1997), number of grains/ear, ear weight, grain weight /ear, grain weight / plant, shelling %, and 100-grain weight (in 1998), compared with earlier or later planting dates aswell .3-scheduling irrigation at 1.3 accumulative Pan Evaporation increased maize grain yield/fed by 10.1 and 12.3 % in 1997 and 1998 season, respectively compared with irrigation at 1.0 (APE). Also, the irrigation at 1.3 (APE) significantly increased grain yield/fed by 20.6 and 39.8% in the first and second season, respectively compared with irrigating at 0.7(APE).4-The irrigation at 1.3 (APE) increased ear length (in 1998), ear diameter, number of rows/ear (in 1998), number of grains/ear (in 1998), ear weight, grain weight/ear, grain weight/plant, shelling % and 100-grain weight (in 1997), compared with irrigation at 1.0 and 0.7 (APE). The increases were almost significant.5-S.C.10 significantly surpassed T.W.C.310 by 9.1 and 22.4 % in grain yield/fed in 1997 and 1998 season,

respectively.6-S.C.10 significantly surpassed T.W.C.310 in ear length (in 1997), ear diameter, number of grains/row (in 1998), number of grains/ear (in 1998), ear weight (in 1998), grain weight/ear, grain weight/plant, shelling % (in 1998) and 100-grain weight (in 1998).7-The interaction between planting dates and cultivars significantly affected grain number/ear, grain weight/plantand grain yield/fed in 1998 season. The highest grain yield/fed in 1998 season was 2030 kg which was produced by planting S.C.10 on the first of June.III. Grain quality :1.Early planting on 15th May significantly increased oil % and Protein % in grain both season, whereas oil yield wasincreased in 1997 season.2.The first June planting significantly increased carbohydrate %, protein yield/fed and oil yield/fed (in 1998).3.Late planting on 15th June significantly increased testa % in grain in both season, but markedly reduced embryo, endosperm, protein, oil and carbohydrate percentages and protein and oil yields/fed.4.Irrigation at 1.3 (APE) significantly increased embryo, endosperm, oil and carbohydrate percentages and protein yield/fed (in 1998) and oil yield/fed, compared with irrigation at 1.0 and 0.7 APE. On the other hand, testa `)/0 was significantly reduced due to scheduling irrigation at 1.3APE.5.Kernels of S.C.10 cultivar recorded higher values in embryo, endosperm, protein and carbohydrate compared with T.W.C.310, with almost significant differences. Also, S.C.10 produced significantly higher protein and oil yields/fed compared with T.W.C.310.IV. Correlation between some agronomic variable and grain yield :1.The data of regression analysis clearly indicated that the major contribution in maize grain yield was found from leaf area index, dry weight/plant, ear diameter, grain weight/ear, and grain yield/plant. The other variable contributions were not significant to affect grain yield.2.The accepted variables, i.e. LAI, dry weight/plant, ear diameter, grain weight/ear, and grain yield/plant contributed in grain yield for about 64.81%, while the removal variables (ear length, number of kernels/ear, ear weight, shelling % and 100-kernel weight) had a slight effect on grain yield, being 2.84 % .V. Water relation for maize crop :1.The total potential evapotranspiration values estimated by ”Modified Penman” method for the early (15th May) intermediate (1’t June) and late planting date (15th June) were 688.22, 662.45 and 631.91 mm in 1997, respectively, corresponding to 721.45, 713.16 and 640.22 mm in 1998.2.The total potential evapotranspiration values for maize, estimated by ”Penman Montieth” method for the three successive planting dates in 1997 were 635, 607 and 603 mm, respectively, corresponding to 642, 628 and 617 mm in 1998 season.3.The total values of ETp using Pan Evaporation method for 15th May,1st June and 15th June planting were 677, 627 and580 mm in 1997 season, respectively, corresponding to 708, 707 and 615 mm in 1998 season.4.The seasonal water consumptive use (ETa) at 1.3, 1.0 and 0.7 APE, averaged over the 3 planting dates and the 2 maize cultivars, reached 480, 419 and 370 min, respectively in 1997 season, being 512, 450 and 393 mm in 1998 season.5.The seasonal water consumptive use combined over the 3 irrigation regimes and averaged over both maize hybrids was 428, 460 and 380 mm for 15th May, 1st June and 15th June plantings, in 1997, respectively. The corresponding values in 1998 season were 456, 485 and 414 mm,respectively.6.S.C.10 recorded higher seasonal water consumptive use over T.W.C.310 in both seasons and at the 3 planting dates and 3 irrigation regimes. The overall average of the seasonal, water consumptive use combined over the 3 planting dates and the 3 irrigation regimes for S.C.10 was 440 and 473 mm in the first and second season respectively, compared with 404 and 430 mm for T.W.C.310 in the tworespective seasons.7.The crop coefficient (Kc) of maize was 0.79 and 0.81 in the first and second seasons, respectively.8.The highest extraction percentages from the sub-surface (30 cm) layer were 82.79 and 84.19% which obtained from 1.3 accumulative pan evaporation treatment in the first and second growing seasons, respectively.9.Water use efficiency increased when maize was planted on the 1st of June in both seasons. Planting maize on 15th May,June and 15th June recorded W.U.E values of 1.20, 1.22 and 1.14 kg grain/m3 water in 1997, respectively, corresponding to 0.81, 0.94 and 0.88 kg grain/m3 water in 1998 for the 3 recpective planting dates.10.Irrigation maize at 0.7 APE in 1997 season produced the highest W.U.E, being 1.22 kg, whereas irrigation at 1.0 APEin 1998 prodced the greatest WUE (0.91 kg grain / m3 water).11.S.C.10 surpassed T.W.C.310 in W.U.E in 1998 season (0.93 as against 0.82 kg), whereas in 1997, no marked differencewas observed (1.18 kg for S.C.10 versus 1.19 kg for T.W.C.310).