Water use and fertilization efficiencies for plant under different irrigation systems

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Two field experiments were conducted during two successive summer seasons of 2006 and 2007 at Bahteem, Water Requirements Research Station., El Kalyobia Governorate —National Water Research Center. Maize (Zea mays, single cross 10) was grown on the investigated soil under two irrigation systems i.e. surface irrigation (G1) and drip irrigation (G2).Nitrogen fertilizer was applied in the form of urea (46% N) at four rates N1 (0kg), N2 (90kg), N3 (120kg), and N4 (150 kg N /fed.). Other cultural practices were done as recommended. The experiment was arranged in a split plot design.The irrigation systems were distributed uniformly in the main plots, while, the nitrogen treatments, were distributed randomly in the sub-plots.The results showed that application of nitrogen regardless of its applied rate could save 24.15 and 24.05% m3/ fed within the first and second seasons, respectively under the surface irrigation system. Under the drip irrigation system the corresponding saved amount of the water requirement reached 37.93 and 38.03%, within the first and second seasons, respectively. Values of monthly and seasonal actual water consumptive use (Cu) were higher when irrigation water was applied by surface irrigation system than drip irrigation system. Values of (Cu) were decreased by increasing rate of the applied N. The highest attained values of irrigation water application efficiency occurred under the drip irrigation system (G2) and N2 treatments in the first and second growing seasons. There was a decline in crop water use efficiency with surface irrigation system in bothSummary and Conclusion -86-seasons. as compared with the drip irrigation system. However the maximum value of crop water use efficiency was obtained under the drip irrigation system (G2) and application of nitrogen fertilizer at a rate of 120 kg/fed. The field water use efficiency was higher under the drip irrigation system than under the surface irrigation one. Values of this parameter increased with increasing rate of the applied N up to 120 kg/fed beyond which it decreased obviously. The effect of rate of the applied nitrogen fertilizer was significant on values of plant height in both two growing seasons.Under all rates of the applied N, values of plant height were higher under the drip irrigation than under the surface irrigation system. However, such an effect of the drip irrigation system on plant height was significant only in the second growth season i.e.2007.The interaction effect between irrigation system and rate of the applied nitrogen seemed to be of no significant effect on height of plant in both growth seasons. The grain yield was highly significantly affected by system of irrigation and rate of the applied nitrogen. The interaction effect between the different studied factors was not significant on grain yield. The concentration of nitrogen in grains of maize was significantly higher in drip irrigation system than the surface irrigation one. Also, rate of the applied nitrogen significantly affected concentration of N in grains of maize plants. However, the highest concentration of nitrogen in maize plants was attained at a rate of 120 kg N/fed beyond which concentration of nitrogen was significantly decreased as compared with the correspondingone attained owing to application of N at a rate of 120 kg N/fed. The nitrogen concentration in the straw of maize was not significantly affected by system of irrigation or rate of the applied nitrogen within the first growth season. In the second season of growth, both systems of irrigation and rate of the applied nitrogen had a significant effect on N concentration unlike what accrued in the first growth season. Likewise, effect of rate of the applied nitrogen was of significant effect on protein content concentration within the both studied seasons.5.1.Conclusion•The obtained results indicated that it may be recommend irrigate maize

plant with drip irrigation (G2) of available water from the upper 30 cm layer of soil with N fertilization at the rate of (120 kg N/fed.) to produce high yield and yield components under Al-Klyoubia province conditions.•Water saving amounted to 37.93 % (550 m3/fed.) according to drip irrigation (G2) and N fertilization at the rate of (120 kg N/fed.)The economic efficiency of treatment G2 achieved the highest net return compared to the other treatment.It may be recommend to irrigate with drip irrigation system with N fertilization at the rate of (120 kg N/fed.) to achieve saved water of (37.93%) from the applied water.