Irrigated silage maize yield and water productivity response to deficit irrigation in an Arid region

ABSTRACT

Simulation models have proven to be useful. The AquaCrop model, which has been expanded by FAO, simulates crop yield based on the applied water under conditions of full and deficit irrigation levels. In this study, the AquaCrop model's performance was tested using data for silage maize (Zea mays L.) under full (100% fulfillment of ETc) and deficit irrigation levels (90, 80, 70, and 60% of full irrigation) in the arid and semiarid environment of central Iran in the Gavkhuni River Basin (GRB). To calibrate this model, we used physiological measurement sets of cropping seasons 2000 to 2002. AquaCrop simulated well the decrease of the biomass yield (B-yield) of silage maize in response to drought as happened in the field. B-yield was decreased by 9.9% under deficit irrigation as compared to fully irrigated conditions. The coefficient of determination (R2) for simulation of B-yield and water productivity (WP) was 0.95 and 0.99, respectively. But the R2=0.77 was not satisfactory for actual evapotranspiration (ETa). The results for all investigated parameters in the three years showed that RMSE, d, ME, CRM, and E values ranged from 0.90% to 3.85%, 0.98 to 1, 1.25% to 6.4%, -0.027 to 0.03, and 0.817 to 100%, respectively. At the end, a local second-degree polynomial crop water production function (CWPF) for silage maize is presented.

Keyword: Deficit irrigation; Silage maize; Simulation model; Biomass yield; Gavkhuni River Basin (GRB)