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Measuring Crop Coefficient (Kc) of Guar (*Cyamopsis tetragonoloba* (L.) Taub) under Gezira, Sudan Condition

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Abstract

A study was planned to estimate the crop water requirements (CWR) of guar (*Cyamopsis tetragonoloba* (L.) Taub) through measuring crop coefficients (Kc) of the Guar under Gezira irrigation conditions as contribution towards the efficient and economic use of water. A field experiment was conducted at Gezira Research Station farm over three seasons (2002, 2003 and 2004), in Wad Medani, Sudan (Latitude 14.23 N, Longitude 33.29 E and Altitude 405 m a.s.l.) in deeply cracking, alkaline heavy clay vertisols. The Kc for guar was estimated by measuring the actual crop evapotranspiration (ETc) and calculated the reference evapotranspiration (ET0) using Penman-Monteith equation. The Kc was derived from irrigation water measurement and gravimetric soil moisture depletion method. Both Kc values were found to have significant relationship with time. The guar final Kc could be derived as a mean of Kc irrigation water and Kc gravimetric, based on the result of the T-test (t critical $t > 0.05$). Results of this study showed a variation of Kc values with different growth stages. The values were found to be 0.44, 1.03 and 0.63 for Kc ini, Kc mid and Kc end, respectively. Results showed that the peak of the final Kc (1.03) was during the period between 60 to 70 DAS, which coincided with the maximum ETc of 6.3 mm day⁻¹ and the maximum mean LAI of 4.7 at the mid-season stage. The crop water requirement (CWR) of guar in the study area of Gezira was measured to equal approximately 682 mm for the total growing period. The result of the study indicated that the relationship between Kc and LAI was statistically significant ($p < 0.01$, $R^2 = 0.83$). Kc of bare soil, calculated from the relationship between Kc and LAI at LAI=0, was found to be 0.49. The mean seed yield of the guar variety (HFG53), grown to estimate Kc, was about 1000 kg ha⁻¹. The average irrigation production efficiency (IPE) was 0.2 kg m⁻³.

Keywords: Crop coefficient, crop water requirements, Guar, Sudan, irrigation scheme