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Water Use Efficiency and Maize Productivity in Ouémé Supérieur, Benin

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Abstract

The imbalance between soil nutrient input and nutrient output, the degradation of soil by erosion and decline of soil organic matter, the increasing invasion of agricultural fields by weeds such as *Striga* and *Imperata* spp. and the very low crop productivity are the observed results of low soil fertility. Due to the low crop productivity and high evapotranspiration caused by the above factors, water use efficiency of the crop is also affected. Practical methods to reduce evaporation from soils and to conserve water could be the use of organic matter and mineral fertilizer. The aim of this work conducted in Ouémé supérieur in the northern part of Republic of Benin is to study the effect of organic matter and mineral fertilizer on water use efficiency of maize.

Field experiment was established in 2002 on three sites (Doguè, Wèwè and Bétérou), using a complete random block with four treatments and eleven replicates distributed in these sites. Treatments were: farmer's practice (T_0); 10 T ha⁻¹ of mulch (T_1); 75 kg ha⁻¹ N, 40 kg ha⁻¹ P₂O₅, 24 kg ha⁻¹ K₂O (T_2) and 10 T ha⁻¹ of mulch with 75 kg ha⁻¹ N, 40 kg ha⁻¹ P₂O₅, 24 kg ha⁻¹ K₂O (T_3).

Water use efficiency was determined by the ratio between the yield or above ground biomass and the actual evapotranspiration (ETA). ETA was estimated using gravimetric humidimetry and tensiometry methods, and was partially measured by the aerodynamic method. Higher yield and WUE (grain, cob and straw) were obtained with T_2 and T_3 . Statistical analysis showed a significance difference between treatments for grain and its WUE (T_0 and T_3), for straw and its WUE (T_0 and T_2 ; T_0 and T_3), proving that water use efficiency is highly affected by mineral fertilizer and the combination of mineral fertilizer and mulch.

Keywords: Evapotranspiration, gravimetric humidimetry, tensiometry, water use efficiency, Benin