

Water-use efficiency and epicuticular wax load in bloom and bloomless phenotypes of *Sorghum bicolor* L.

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Sorghum (*Sorghum bicolor* L. Moench) is a C₄ cereal grain crop which is grown in semi-arid tropics of Africa and Asia, and is an important component in traditional farming systems and in diets of millions of people. Improving water-use efficiency (WUE) of crops which is the ratio of whole-plant biomass to cumulative transpiration is becoming a main goal for agriculture and food security goals. In this study, water use was apportioned into transpiration (T) and soil evaporation (Es), water-use efficiency (WUE), transpiration efficiency (TE), and the biomass produced per unit water transpired were calculated. Bloomless which visually exhibit an absence of white fluffy epicuticular wax in leaf sheath was characterized by physiological approaches. A greenhouse experiment was conducted at College Station, TX, 2015 by using a mutation breeding approach to obtain near isogenic lines of *Sorghum* M401 and Tx623 where M401 was generally a low-wax load (WL) genotype and was the male parent and the Tx623 (ms3) was the recurrent parent. A total of 50, F₄ recombinant inbred lines (RILs) were derived from cross of Stg4XM1789. Net CO₂ assimilation rate, stomatal conductance, transpiration rate and water use efficiency were measured on the fully developed flag leaves in irrigated and non-irrigated 40 days old plants using CI-350 photosynthesis system. Leaves were collected from bloom and bloomless lines and epicuticular wax load and cumulative water loss (CWL) were measured, also the relationship among EWL, CWL and water-use efficiency were analyzed. Differences in response to irrigation level varied between both genotypes. Among irrigated plants bloomless (XS2) exhibited higher water use efficiency than bloom (XS1). Among non-irrigated plants, bloom (XS1) exhibited lower water-use efficiencies than bloomless (XS2) respectively. Water-use efficiency measured in non-irrigated bloomless mutant line with no visible wax structure on the abaxial leaf surface was more than 40% below that measure in bloom. The water loss from the excised leaves was greater in bloomless lines than in bloom lines. Water-use efficiency varied linearly with epicuticular wax load under irrigated and non-irrigated conditions.

Biography

Salma Bibi is currently pursuing her Master's majoring in Molecular and Environmental Plant Sciences from Texas A & M University, USA.

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