

Effects of water stress on tomato genotypes' growth, yield, and water use efficiency at different growth stages

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Water is the major factor limiting plant productivity in many regions. The effects of water stress at different growth stages on the growth, yield, and water-use efficiency (WUE) of four tomato genotypes cultivated under open field conditions were investigated during two growing seasons. A split plot-based layout with a randomized complete block design was used. At vegetative, flowering, and fruiting stages, tomato plants were irrigated at 100%, 75%, and 50% of crop evapotranspiration (ET_c) water requirements (main plots); tomato genotypes were included as subplots. Significant differences among growth parameters were detected among irrigation treatments, tomato genotypes, and their interactions. Most growth parameters decreased significantly with increasing water stress; Fruit set, number of fruits, yield per plant, and total yield decreased under water stress. Tomato genotypes differed in their response to water stress. The higher total yields were obtained with the genotype KSU-TOM-102 under irrigation treatments with 100% of ET_c during all stages and 75% of ET_c during the fruiting stage. The highest WUE was found at an irrigation regime with 50% of ET_c during the entire growth cycle and 75% of ET_c during the fruiting stage. Comprehensive analysis of field data revealed that tomatoes irrigated at 75% of ET_c during the fruiting stage had enhanced water use efficiency. This water regime may be recommended for optimal tomato production under open field conditions because it maximizes the water use efficiency of this crop without decreasing fruit yield significantly, compared to the control treatment.