ABSTRACT

In the present study, four wheat cultivars (cv. Anaj-17, cv. Fakhar-E-Bhkkar, cv. Jouhar-16 and cv. Ujala-16) were selected and exposed to a simulated heat wave for 3 to 6 hours on a daily basis with a temperature 3 °C higher than control by using the plant growth chamber and wire house. The growth of plants was monitored at every ten days interval till harvest. The following parameters; number of leaves (n), plant height (cm), total above ground and below ground biomass (g), shoot length (cm), root length (cm), photosynthesis rate, stomatal conductance, transpirational rate, intrinsic and instantaneous water use efficiency, stomata and stem anatomy, yield related parameters such as grain number, weight of 100 grains, grain yield, harvest index and heat susceptibility index (HSI) were measured. In the four cultivars, the number of leaves, plant height (cm), fresh and dried weight of leaves, root and shoot, total above ground and below ground biomass (g) ratio, shoot length (cm) root length (cm) were reduced in treated plants at anthesis and post-anthesis stages. Rate of transpiration (E) and stomatal conductance (g_s) increased with rising temperature. Photosynthetic rate was also decreased (21-55 µmolm^{-2}sec^{-1}) compared to the control (63-74 µmolm^{-2}sec^{-1}). However, temperature treatment resulted in a higher transpiration rate (0.8-1.9 molm^{-2}sec^{-1}) than the control (0.7-1.6 molm^{-2}sec^{-1}). Similarly, stomatal conductance was increased under elevated temperature (0.34-0.52 molm^{-2}sec^{-1}) compared to the control (0.37-0.52 molm^{-2}sec^{-1}) except for the Anaj-17 cultivar which showed a significant increase ($P < 0.001$), in the control plants (1.26 molm^{-2}sec^{-1}). While intrinsic water use efficiency was reduced to (53-101 µmol mol^{-1}) in treated plants than in control plants (50-238 µmol mol^{-1}). Except for the Anaj-17 cultivar, instantaneous water use efficiency was reduced to (14-63 µmol mmol^{-1}) in treated plants compared to the control plants (20-102 µmol mmol^{-1}) during the temperature stress. Stomatal length and vessel diameter were reduced to (26-38 µm and 41-56 µm) compared to their controls (50-44 µm and 50-68 µm) respectively, under the temperature stress. Grain weight (g), grain yield and grain number per plant are significantly different in Fakhar-E-Bhkkar ($P < 0.001$) followed by Jouhar-16, Anaj-17 and Ujala-16 ($P < 0.05$) respectively. In conclusion, Fakhar-E-Bhkkar and Jouhar-16 were more susceptible to heat waves (S>1.0) while Anaj-17 and Ujala-16 cultivars were moderately heat tolerant varieties (S>0.5).