In order to assess the short- and long-term impacts of UV radiation (UVR, 280–400 nm) on the red tide alga, *Heterosigma akashiwo*, we exposed the cells to three different solar radiation treatments (PAB: 280–700 nm, PA: 320–700 nm, P: 400–700 nm) under both solar and artificial radiation. A significant decrease in the effective quantum yield (*Y*) during high irradiance periods (i.e., local noon) was observed, but the cells partially recovered during the evening hours. Exposure to high irradiances for 15, 30, and 60 min under a solar simulator followed by the recovery (8 h) under dark, 9 and 100 µmol photons m^{-2} s^{-1} of PAR, highlighted the importance of the irradiance level during the recovery period. Regardless the radiation treatments, the highest recovery (both in rate and total *Y*) was found at a PAR irradiance of 9 µmol photons m^{-2} s^{-1}, while the lowest was observed at 100 µmol photons m^{-2} s^{-1}. In all experiments, PAR was responsible for most of the observed inhibition; nevertheless, the cells exposed only to PAR had the highest recovery in any condition, as compared to the other radiation treatments. In long-term experiments (10 days) using semi-continuous cultures, there was a significant increase of UV-absorbing compounds (UV_{abc}) per cell from 1.2 to >4 × 10^{-6} µg UV_{abc} $cell^{-1}$ during the first 3–5 days of exposure to solar radiation. The highest concentration of UV_{abc} was found in samples exposed in the PAB as compared to PA and P treatments. Growth rates (μ) mimic the behavior of UV-absorbing compounds, and during the first 5 days μ increased from <0.2 to ca. 0.8, and stayed relatively constant at this value during the rest of the experiment. The inhibition of the *Y* decreased with increasing acclimation of cells. All our data indicates that *H. akashiwo* is a sensitive species, but was able acclimate relatively fast (3–5 days) synthesizing UV-absorbing compounds and thus reducing any impact either on photosystem II or on growth.