Deficit irrigation conditions decreased safflower seed yield, oil yield, and seed oil content. Safflower cultivars demonstrated different reactions in respect to oil production under different levels of drought stress. So, selection of suitable cultivar under water stress conditions warrants achievement of higher performance. Sina and Faraman cultivars had higher seed oil content across all irrigation treatments. The highest oil yield per unit area across all irrigation treatments was also produced by Sina cultivar, which was associated with higher seed yield per unit area. Harvest time deferment was associated with increased oil oxidation across all cultivars.