

The contribution of transpiration and respiration processes in the mass loss of pomegranate fruit (cv. Wonderful)

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Abstract

Mass loss from fresh produce is associated with quality degradation during storage. Though transpiration is the main process, respiration can significantly contribute to mass loss, especially at higher than normal humidity conditions where the transpiration rate is negligible. In this paper, the relative contribution of the transpiration and respiration processes to the total mass loss of fresh pomegranate fruit were investigated. The study quantified the effects of storage temperature, relative humidity (RH) and time on these processes. Fruit were stored at 278.15, 288.15 and 298.15 K and 77, 82 and 93% RH for 43 d. Total rate of mass loss ranged from 0.036 to 0.886 $\text{mg m}^{-2} \text{s}^{-1}$ (0.002 to 0.060 $\text{mg kg}^{-1} \text{s}^{-1}$). Net transpiration rate ranged from 0.002 to 0.055 $\text{mg kg}^{-1} \text{s}^{-1}$ at vapour pressure deficit (VPD) between 0.010–0.544 kPa. Water loss and carbon losses due to the respiratory process contributed up to 35% and 23% at high RH (93%) and 4% and 3% at lower RH (77%) of the total mass loss, respectively, and the rest was due to VPD. For the range of temperature and RH tested in this study, RH had the greatest influence on the transpiration rate and respiratory mass loss compared to temperature. The relative contribution of the two processes to the total mass loss under different storage conditions is an important step towards improvement and design of effective control strategies.