

**Title** Respiratory metabolic changes in 'Fuji' apples during prestorage exposure to freezing temperature and subsequent refrigerated storage as related to the incidence of flesh browning

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#### **Abstract**

Impact of postharvest exposure to freezing temperature (FT) on fruit physiology of 'Fuji' apples was investigated as related to quality changes and the development of flesh browning disorder during storage. Fruit were harvested near commercial maturity, exposed to  $-3.0 \pm 0.5^{\circ}\text{C}$  for 15 days, and then stored at  $0^{\circ}\text{C}$  for three additional months. Exposure to FT for over 10 days enhanced abnormal respiratory metabolism resulting in significant increases in internal ethanol and acetaldehyde. The metabolism appeared to recover from the FT impact when fruit were transferred to room temperature or gradually during the subsequent storage period at  $0^{\circ}\text{C}$ . Immediately after FT exposure, neither visible internal disorder nor significant quality deterioration was observed. Starting from the 15<sup>V</sup>th day of storage, however, internal browning disorder developed in FT-subjected apples. The results suggest that visible freezing damage and severe quality deterioration do not occur incidentally by freezing phenomena itself. Interruption of respiratory metabolism and resultant fermentative compounds may be a potential factor, eventually inducing internal disorder after a certain lag period, regardless of recovery from the FT exposure impact.