Impact of low oxygen storage on quality attributes including pigments and volatile compounds in 'Shelly' mango

Makgafele Lucia Ntsoane, Alexandru Luca, Manuela Zude-Sasse, Dharini Sivakumar and Pramod V. Mahajan

Scientia Horticulturae 250: 174-183. (2019)

Abstract

Optimal oxygen conditions in controlled atmosphere storage play an important role in maintaining quality and extending shelf life of mangoes, especially for long distance markets. The aim of the study was to investigate the low O₂ tolerance limit of 'Shelly' mango fruit based on quality attributes including pigments and accumulation of O₂ restricted volatile organic compounds (VOCs). Spectroscopy in the visible wavelength range was applied in diffuse reflectance mode as a non-destructive method for monitoring the pigment contents. Furthermore, the relationship between non-destructively measured pigment indices and pigment content was investigated. The spectral reflectance measurements predicted the pigment content in mango fruit ($R^2 \ge 0.70$). However, experimental results showed that low O₂ had no impact on pigment contents. Soluble solids and individual sugars (sucrose, fructose, and glucose) increased in all storage conditions. Significant differences were found in VOCs, 1% O₂ resulted in significant accumulation of anaerobic metabolites: ethanol, ethyl acetate, 3-hydroxy-2-butanone, ethyl butanoate, 1-butanol, 2, 3-butanediol, ethyl propanoate, 2, 3-butanediol, undecane. Sensory analysis indicated that the panelists rejected fruit stored at 1% O₂ due to unfavorable odour and taste. The results showed that 5% is the low O₂ limit for 'Shelly' mango, below which anaerobic metabolites accumulated compromising the acceptability of the fruit due to 'off-flavour'. However, storage conditions of 10% O₂ can already result in reduced fruit mass loss and respiration rate; maintained the fruit flesh firmness, soluble solids content, and individual sugars in 'Shelly' mango after 21 d of storage.