

Title Shelf stability of Dhakki dates as influenced by water activity and headspace atmosphere
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Abstract

Date palm (*Phoenix dactylifera* L.) has played a vital role in the history of mankind by providing food and shelter to millions of people. Pakistan is the 4th largest date producing country, contributing 11% to world production. A prominent local cultivar 'Dhakki' of Dera Ismail Khan is economically very important as it has large fruit (5 cm long, 3 cm thick and 20 g/fruit) with a small pit, fine texture and delicious taste. However, being a late maturing variety, it is prone to environmental stresses as the stormy monsoon season coincidences with the period of fruit ripening. Uneven production and a lack of post-harvest technology are two factors that cause quality deterioration and excessive wastage. In this study, a sorption isotherm was constructed in the range of 0.12 to 0.97 a_w , and water activity determined for Dhakki dates. The stability of Dhakki dates was examined at 0.52 - 0.75 a_w under oxygen, air or nitrogen during storage for 4 months inside tins at an elevated temperature of 40°C. The quality was evaluated monthly in terms of darkening, pH, and titratable acidity, whereas slime appearance was observed twice daily. The sorption isotherm is sigmoid in shape, and water activity of 0.25 to 0.62 a_w represented the monolayer moisture coverage, whereas 0.61 ±0.01 a_w was recorded for the freshly ripened Dhakki dates. The deterioration of quality was affected by both water activity and headspace atmosphere. Samples stored with water activities higher than 0.75 a_w deteriorated rapidly with slime formation, whereas those with lower levels displayed proportionately greater stability and at 0.52 a_w , maintained characteristic color and flavor with a semi-dried look. The samples stored under nitrogen afforded greatest stability. The rate of darkening, pH and titratable acidity were about 2.2, 2.8 and 2.7 times higher, respectively, under oxygen than under the nitrogen. The impact of water activity and headspace atmosphere on quality parameters was statistically significant. In order to maintain freshness of the product with extended shelf life the Dhakki dates should be stored under inert atmosphere with a water activity close to 0.61 ±0.01 a_w .