

Title Engineering aspects of the utilization of controlled atmosphere (CA) technology in shelf life extension of fresh barhi dates at khalal stage of maturity at a semi-commercial level

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Abstract

The large amount of fresh dates at their khalal stage of maturity produced in Saudi Arabia requires additional concerted efforts exerted by researchers and investment and development sectors to look for new marketing channels to get advantage of this nationally strategic product. An important channel would be preserving fresh dates through utilizing controlled atmosphere technology based on scientific approach.

This applied research study aimed at utilizing of controlled atmosphere (CA) technology to extend the shelf life and maximally preserve the fresh quality of the Barhi cultivar (distinguished by its delicious sweet taste and distinctive texture). This research has been performed at a semi commercial level using CA system.

In this research, fresh Barhi fruits at khalal stage was stored at 0 (°C) and different concentrations of oxygen and carbon dioxide gases, and ordinary atmosphere (21/0.003 (CO₂/O₂ (%V/V))). The project studied three important aspects, namely, engineering aspects of the CA process, quality aspects of the stored fruits, in addition to the economical feasibility of production.

The storage conditions were frequently monitored throughout the storage period which extended for 150 days (5 months) for the Barhi fruits. Engineering properties namely physical, mechanical, and thermal properties of the fresh and stored Barhi fruits at khalal stage of maturity were experimentally measured as a function of storage conditions and time. Physical properties included fruits mass, density, diameter, length, volume, surface area and color. Experiments on mechanical properties included compression and penetration tests for determination of modulus of elasticity, bioyield point, maximum force, rupture point, penetration modulus and stiffness. Experimentally measured thermal properties were specific heat, thermal conductivity and thermal diffusivity. All engineering properties data were presented as a function of storage conditions and time. Rates of respiration and ethylene production of fresh Barhi fruits were presented as a function of temperature. Samples of stored Barhi fruits were sorted monthly during the storage period to intact high quality fruits, partially or totally soft fruits (ripened to rutab stage of

maturity), and wrinkled fruits. The percentages of the categorized sorted fruits were presented as a function of storage conditions and time.

The success outcome of this project is highly useful and implemental for the palm tree farmers and date production and processing sector in the Kingdom of Saudi Arabia. It will contribute in encouraging production and export of high quality dates to local and international markets. At the end, high quality fresh dates would be available most of the year to consumers.