

Title The performance of fan-pad evaporative cooling system in dates storages under the climatic conditions of Saudi Arabia

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Citation Abstracts of 7th International Postharvest Symposium 2012 (IPS2012). 25-29 June, 2012. Putra World Trade Centre (PWTC), Kuala Lumpur, Malaysia. 238 pages.

Keywords date; storage

Abstract

A major concern after dates harvesting is dates loss due to limited availability of suitable conditions in dates storages including air temperature and relative humidity. Cold storages equipped with mechanical refrigerant cooler that have high capital and running costs are used for storing dates. This study investigated the performance of the fan-pad cooling system compared with a refrigerated air cooler and a naturally ventilated system in Dates storages. Dates (kalas variety) at a tamr stage were stored in all storages for six months. Measurements included: amount of water and electric power consumed for cooling, air temperature and relative humidity inside each storage, and the amount of weight gain or loss of dates. Results showed that air temperatures inside the evaporatively cooled storage were determined primarily by the ambient conditions. Air temperature inside the mechanically-cooled storage was low and can be maintained at the desired level. It appeared that outside conditions were identical with those of the naturally ventilated storage. Low levels of relative humidity were observed inside the naturally ventilated storage, while the levels of relative humidity were high inside the cold storages. The total amount of cooling water consumption for the evaporative cooler during the experimental period was 13.1 m³, while the monthly consumption varied between 1.67m³ during January and 3.51 m³ during April. It appeared that evaporative cooler was running continuously without reaching the desired temperatures (7-12°C) because temperature reduction by an evaporative cooler is limited by ambient conditions. As a result of this, the amount of electricity consumed for evaporative cooling was considerably higher than that for the mechanicallycooled storage where the desired temperature has been reached. However, when the set point temperature was increased to the range of 12-16°C, electricity consumption for the eevaporatively cooled storage was considerably less than that for the mechanically-cooled storage. Results showed that mass of dates was increased significantly during storage in the evaporativly and mechanically cooled storages because of the high levels of relative humidity in those rooms. These results were supported by the increase of moisture content and water activity in the cooled storages. However, in the naturally ventilated storage, dates lost much of their mass due to the low

relative humidity at ambient. Further research studies are needed to examine various storage conditions with different types of packaging.