Performance of a convective, infrared and combined infrared-convective heated conveyor-belt dryer

Authors
Hany S El-Mesery, Gikuru Mwithiga
Publication date
2014
Journal
Journal of Food Science and Technology
Pages
1-10
Publisher
Springer India

Abstract A conveyor-belt dryer was developed using a combined infrared and hot air heating system that can be used in the drying of fruits and vegetables. The drying system having two chambers was fitted with infrared radiation heaters and through-flow hot air was provided from a convective heating system. The system was designed to operate under either infrared radiation and cold air (IR-CA) settings of 2000 W/ m2 with forced ambient air at 30 °C and air flow of 0.6 m/s or combined infrared and hot air convection (IR-HA) dryer setting with infrared intensity set at 2000 W/m2 and hot at 60 °C being blown through the dryer at a velocity of 0.6 m/s or hot air convection (HA) at an air temperature of 60 °C and air flow velocity 0.6 m/s but without infrared heating. Apple slices dried under the different dryer settings were evaluated for quality and energy requirements. It was found that drying of apple (Golden Delicious) slices took place in the falling rate drying period and no constant rate period of drying was observed under any of the test conditions. The IR-HA setting was 57.5 and 39.1 % faster than IR-CA and HA setting, respectively. Specific energy consumption was lower and thermal efficiency was higher for the IR-HA setting when compared to both IR-CA and HA settings. The rehydration ratio, shrinkage and colour properties of apples dried under IR-HA conditions were better than for either IR-CA or HA.

Keywords Dryer settings . Apple slices . Drying rate . Infrared radiation . Hot air convection . Rehydration . Shrinkage . Colour . Specific energy consumption . Thermal efficiency