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Performance Evaluation of a Large-Scale Polyethylene Covered Greenhouse Solar Dryer

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Abstract

This paper presents experimental and simulated performance of a polyethylene covered large-scale solar greenhouse dryer. The dryer consists of a parabolic roof structure covered with a polyethylene sheet. This dryer has a width of 7.5 m, length of 20.0 m and height of 3.7 m, with a loading capacity of about 1,000 kg of fresh fruits or vegetables. Six 15-W DC fans powered by three 50-W PV modules were used to ventilate the dryer. The performances of the dryer for drying of chili and banana were investigated. Drying air temperatures inside the dryer varied from 35°C to 64°C. The drying time of these products was 3 to 4 days shorter than that of the natural sun drying and the colour of the dried product obtained from this dryer is better than those from natural sun drying. A system of partial differential equations describing heat and moisture transfer during drying of chili and banana inside the solar greenhouse dryer was developed and this system of non-linear partial differential equations was solved numerically using the finite difference method. The numerical solution was programmed in Compaq Visual FORTRAN version 6.5. The simulated results agreed well with the experimental data for solar drying of chili and banana.

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