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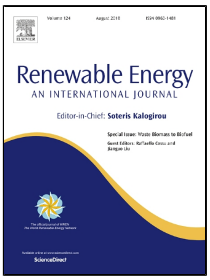

Experimental study and numerical modeling for drying grapes under solar greenhouse

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Experimental study and numerical modeling for drying grapes under solar greenhouse

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Abstract

Renewable energy, in particular solar energy, is becoming world widely spread. Solar energy is a non-polluting viable and economical source used in several fields such as drying. This work presents a combined numerical and experimental study of grape drying in a mixed mode using a solar greenhouse dryer. The experimental set up consists mainly of a solar air collector and a chapel-shaped greenhouse. The experiments were carried out in two steps. First, the solar collector was tested to study its performance before being coupled to the greenhouse. Second, the system was used to perform drying experiments. The variation of the product moisture content and the principal drying parameters were analyzed. The collector efficiency with a flow rate equal to 0.05 kg/s changed between 29.63 % and 88.52 % for the drying days. The moisture content of grape was reduced to 0.22 (g water/g dry matter) from its initial moisture content of 5.5 (g water/g dry matter) in 128 hours.

A mathematical model was developed in order to simulate the system in the appropriate conditions on TRNSYS software.

The simulation results were compared to the experimental data. Also, the new model was compared with the classical one for validation purposes.

Keywords: grape, solar greenhouse mixed dryer, TRNSYS simulation.