Modeling and experimental studies on a domestic solar dryer
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**abstract**
A domestic solar dryer with transparent external surfaces was designed, built and tested. Thin-layer drying models that describe the drying phenomena in a unified way, regardless of the controlling mechanism; have been used to estimate the drying period for several products. Temperature of the drying medium is one of the factors that affect the drying rate constant of the exponential model. This fact introduces a problem when used to predict the drying rate under solar drying conditions since the temperature of the drying medium is rarely constant. This paper aims to propose a solar dryer with a uniform temperature profile that meets the requirements of the exponential model over a wide range of cases, thus, providing a simple and accurate design tool. The dryer is characterized by collecting the maximum possible solar energy by having a longer drying period, and allows the fixed dryer to approach the performance of the tracked one with all technical and economical advantages of the tracking system. The performance was tested under different operational conditions and the drying characteristics were experimentally investigated by conducting the experiments on two local herbs, Jew’s mallow and mint leaves. The dryer was able to reduce moisture of the tested products to the recommended level (6% wb) in about a 12 h period. The reliability of the exponential model was evaluated by comparing the experimental with the predicted curves. A reasonable agreement was found for the different tests carried out for the entire drying period.

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