# Experimental investigation of various designs of solar flat plate collectors: Application for the drying of green chilli

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**Abstract**

This paper presents an experimental study by comparing between the thermal performance of three types of solar air flat plate collectors, FPCs: (i) without obstacles, (ii) with rectangular obstacles, and (iii) with trapezoidal obstacles in the air flow duct. In order to determine the best performing model, we have proceeded to reversing the flow direction, in each collector, and comparing the six obtained models under outdoor conditions. All collectors were designed, constructed, and tested in the University of Biskra (Algeria) in a stand facing south at an inclination angle equal to the local latitude. Thus, we have proceeded to the application of the best system for the drying of the green chili. We have sought to determine the moisture content and loss of mass for the forced convection hot air drying of the product and their temperature dependence. In comparison with the recent literature, at different air mass flow, the highest efficiencies (77%) were obtained from the FPC with trapezoidal obstacles, when the air was blown down at air flow rate 0.043 kg/s. In addition, this study has allowed us to show that (i) for a same geometry, the highest efficiencies were always obtained when the air was blown down in the solar air FPC and (ii) the use of obstacles, in the air flow duct of the FPCs, is an efficient method to improve their performances, especially when the air is blown down. The obstacles ensure a good air flow under the absorber plate, create the turbulence, and reduce the dead zones in the collector.

**Keywords :** 3D finite element, wedge element, Space Fibre Rotation, zero\-energy modes.

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