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Hybrid-Active solar thermal cylindrical chamber for Citrus Hystrix leaves drying

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Abstract This article presents a study of a modular hybrid active solar drying system (MHASD) with parallel collector configuration for the dehydration process of the Citrus Hystrix plant in a cylindrical drying chamber. The system utilized a novel cylindrical drying chamber for solar and low temperature drying integrated into the MHASD system. The experiments were conducted outdoors and exposed to the external environment. The dryer performance was studied by measuring the heat recovered in the drying chamber, the moisture removal capacity, and the efficiency of the MHASD system based on the drying load of Citrus Hystrix sheets. The effectiveness of air flow and temperature distribution in the cylindrical drying chamber was investigated using the computational fluid dynamics (CFD) method. The air temperature in the drying chamber with the hybrid system reached 45 degrees C to 60 degrees C on a day with clear skies and variable weather. The drying time of the leaves was 6.5 h when collectors were used, while with the hybrid system it took 4 h to reach the final mass of 16 g. In intermittent weather conditions, the highest drying efficiency of 35.24 % was observed with the hybrid system, while drying with collectors was 17.26 %.

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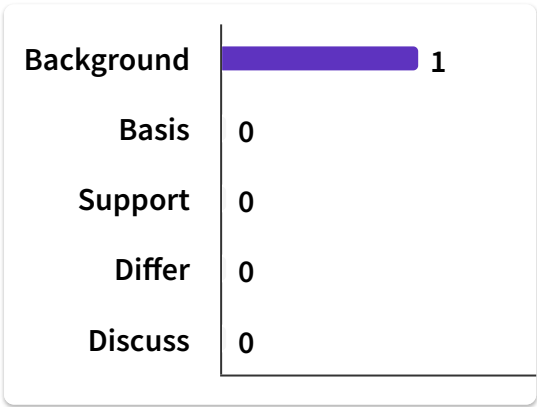
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