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Experimental Analysis of the Thermal Behaviour of a Dual Solar - Biomass Tunnel Dryer Type "Hohenheim" for Aromatic Plants

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Abstract

Colombia has an important production potential of a wide variety of aromatic plants that find extensively use in the pharmaceutical and cosmetic sectors. However the currently industry of aromatic plants is incipient with a production concentrated only on fresh product. The drying process inhibits the growth of microorganisms and the decomposition process of the plants resulting in reduction of losses of harvested crop and an increase in the duration of the plants. It also adds value to the product and reduces transportation costs when comparing to fresh products. The currently commercialisation of dried products in the country is limited to a small local market due to inadequate and inefficient processes. The implementation of drying processes in the current Colombian agro-industry faces two challenges: The development and use of efficient economic driers that use available and cheap energy resources and the production of high quality dried products.

In the present work experimental results of the thermal behaviour of a dual solar ‰biomass tunnel dryer type "Hohenheim" are presented. The incorporation of a biomass burner allows continuous operation of the drier without depending of the presence of solar radiation. The total area of the solar collector is 16 m^2 and the drying area is 20 m^2. The capacity of the drier is 2 to 5 kg m^2 depending on the variety of plant. The drier is located near Bogotá, the capital city of the country. Combustion of coffee shells is used for obtaining the thermal energy for drying when using biomass. This biomass is a residual product obtainable in large quantities in the country.

In a continuous test of 50-hours temperature and relative humidity profiles along and across the drier. Graphics of longitudinal profiles and transverse sections of relativity humidity and temperature in dependence of the air flow and solar radiation are obtained. The drying chamber and collector efficiency are calculated. A linear relationship between solar radiation and air velocity is obtained. The temperatures in the collector varied between 11, 69°C and 79, 02°C and in the drier between 13, 6 °C and 69, 5°C.

Keywords: Biomass, drying, energy yield, quality, solar energy

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