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Drying of *Mentha spicata* in a Dual Solar-Biomass Tunnel Dryer in Colombia

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Abstract

Colombia is a country with a very high production potential of aromatic plants due to its variety of climatic conditions and available arable land. The currently industry of aromatic plants is incipient with a production concentrated only on fresh product. The commercialisation of dried products is limited to local market. The drying process is inefficient causing high energy consumption and a product with low quality standards. The development and implementation of efficient economic driers in which high quality products can be obtained is a very important task in Colombia.

A dual (solar-biomass) tunnel drier, based on the Hohenheim type which overcomes the problem of different climatic conditions is constructed and tested. This new concept includes a modular structure that facilitate mobility, side windows to help control the temperature inside the dryer while running in the solar mode and trays for the up and download of the product. The dryer is designed for 24 hours operation; the thermal energy is obtained through solar radiation during the day and biomass burning during the night. The total area of the solar collector is 16 m², the drying area is 20 m². The capacity of the drier is 2 to 5 kg m⁻² depending on the drying product. The dryer operates in a farm near Bogotá, the capital city of Colombia, which is located in the Andean region of the country. The mean radiation varies between 300 and 900 W m⁻² between 9:00 a. m. and 5:00 p. m. Coffee shells, a residual biomass available in large quantities in the country, are used as biomass source. The power consumption of the dryer is 240 W when it works with the solar system and 260 W when it works with biomass.

Experimental results of the performance of the tunnel during drying of *Mentha spicata* are presented. Air temperature and relative humidity together with product temperature and water content were continuously measured at different lengths of the drier. Collector and burner efficiencies were determined. The loss of essential oils and colour changes of the product during drying were also measured.

Keywords: Drying, renewable energy, tunnel dryer