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DESIGN, DEVELOPMENT AND PERFORMANCE TESTING OF A NOVEL INDIRECT SOLAR DRYER

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ABSTRACT – A simple and innovative indirect solar dryer composed of integrated solar collector and drying chamber partitioned with a black cotton cloth which serve as heat absorber was constructed and tested. To study the performance of the dryer at no load (no drying product) and full load (with drying product) conditions, measurements of total solar radiation on a horizontal plane, temperature and relative humidity of the ambient and the dryer as well as the solids moisture loss-in-weight data were made for an hourly interval. At no load, average temperature ranged from 45-103OC during the no airflow-no sunscreen and with airflow-no sunscreen set-up conditions and, 45-62OC under the airflow-with sunscreen condition. At full load, drying of mango halves was done using no airflow-no sunscreen, with airflow-no sunscreen and with airflow-with sunscreen set-up conditions with temperature ranges from 41-91, 30-70, and 22-65OC respectively. Moisture content was reduced from 84.5% to an average of 11% (w.b.), and also beta-carotene loss varied from 15-30% as compared to 44% in sun drying. An equivalent CO2 emissions of 0.01 kg/hr per trial was produced from the used of electricity in running the exhaust fans.

Keywords: Black cloth, sunscreen, integrated dryer, mango halves, beta-carotene, carbon emissions

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