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Evaluation of solar tunnel drier developed by University of Hohenheim under Sri Lankan environmental conditions

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The solar tunnel dryer developed by the University of Hohenheim has a drying arm and a collector arm of length 10 m and 8 m respectively. The arms are 2 m in width and provide 20 m² of drying bed capacity. The solar air heater is connected directly to the drying tunnel and both are covered by a transparent UV-stabilized PE plastic foil. The dryer showed direct & indirect drying and least resistance to horizontal air flow thus easing loading/unloading. This dryer was studied to identify necessary improvements so that marketable dehydrated products could be produced. A prototype solar tunnel dryer similar to the one developed by the University of Hohenheim was built at the Industrial Technology Institute (ITI) premises in Colombo, along east-west direction and its performance was tested. Temperature, relative humidity and air flow rate during the tests were recorded. It showed best performance when peak temperature development occurred at 60-65 °C at noon on an average sunny day. A maximum temperature development of 75-80 °C was observed on hot sunny days. However, the temperature development during the morning and evening was below the optimal temperature for drying of perishables i.e 45–60 °C. Batch trials were carried out using jak fruit (*Artocarpus heterophyllus*) and brinjal (*Solanum melongena*), and the dryer showed the required reduction of moisture content in both after a drying period of 3 to 4 days. The extended drying time also resulted in loss of product quality. Overall sensory attributes were 5 and 4 (poor) on this batch of products which showed unacceptable market quality, according to the 9-point hedonic scale, due to long drying periods and keeping the materials in the drying compartment overnight. The results showed that the dryer essentially needed a supplementary source to shorten the drying period together with maintenance of a correct temperature inside the drying compartment during non solar hours to preserve the quality of dehydrated products. However, tests conducted with the low cost dryer in the Rajanganaya area showed that the prototype dryer was suitable for adoption of perishable dehydration in areas of dry climates. It is recommended that a clear glass roof be used in place of PE plastic to resist wind damage in such areas.