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Design, fabrication and evaluation of flat bed type solar drying system for pepper drying

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Drying of agricultural commodities is a critical problem for producers due to several reasons such as coincidence with rains during harvesting season etc. Black pepper (*Piper nigrum* L.) the major spice crop produce in Sri Lanka that is processed mainly for the export market, which is harvested in November to January and May to July during the period of *Maha* and *Yala* rains respectively and so, the growers face a serious problem for the production of high quality black pepper that eventually leads to low market prices. However, some growers and collectors rent paddy drying yards in the dry zone areas and dry their harvest during these seasons, where small and middle scale farmers cannot practice it due to high transport cost. Therefore, it was aim to design and fabricate a solar drying system with locally available materials targeting the small scale farmers.

The drying system was fabricated with two compartments; (a). the drying chamber and (b). the solar collector using locally available materials. Drying bed was made using a plastic mesh. Single phase electric blower was used to blow hot air from the solar collector to the drying chamber. Dryer was evaluated for black pepper to observe its performances while a sample was allowed to sun drying as a control. Samples were collected at regular intervals to determine the moisture content. Temperature of the inlet of the drying chamber, surface temperature of drying bed and ambient temperature were measured at regular intervals by using thermocouple thermometer.

The moisture content decreased to 12 % within 15 hours in the solar dryer where as sun drying needed 18 hours. The temperature of the drying chamber varied within the range of 40^{o}C to 64^{o}C. Moisture variations of pepper in the drying bed were almost same in the areas of inlet, middle and the outlet. The final moisture content, 12 – 14% of black pepper was reached within the same drying period every where in the bed. It was found that the heated air distribution of the chamber is satisfactory with even drying. The Labour use for drying was observed to be very much less. The quantity used per batch is low and can be handled by one labourer easily. The moisture content of the fresh pepper was reduced to 12 % within 15 hours and cost of production of the final product is Rs. 8.66 for drying fresh kg and Rs. 24.75 for dry kg. Therefore the flat bed type solar dying system was found to be a satisfactory fabrication for the processing of small scale harvests of the farmers. Further modifications and evaluations are needed before introduce the drying system to the farmers.

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