

DESIGN AND DEVELOPMENT OF A MULTI-CROP HOT-AIR SOLAR DRYER

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Appropriate technology for conversion of solar radiation to thermal energy is vital for food dehydration. Solar drying considered as an elaboration of sun drying, is an efficient system of utilizing solar energy. Reliable and low-cost multi-crop solar drying technique is required for small scale farmers in Sri Lanka. Therefore, the objective of this study was to design and develop a multi-crop hot-air solar dryer for small scale farmers. Design, fabrication, and testing were done in National Institute of Post Harvest Management, *Anuradhapura*. The main components of the equipment were flat plate solar collector, drying chamber, solar panel with air heater, turbo ventilator, exhaust fans, and temperature controller. Mild steel angle iron bars, blue iron sheets, plastic coted wire mesh, rigiform, aluminum foils, galvanized sheet, and rubber insulators were used to fabricate the prototype. Experiments were carried out to compare the open sun drying technique with multi-crop hot-air solar drying before and after installing the heater. Bitter gourd, jackfruit, and mushroom were the crops used in the experiment. The moisture removal rate of the solar dryer with heater for each crop was significantly higher than the other treatments ($p < 0.05$). The moisture removal rate for bitter gourd, jackfruit, and mushroom after installing the heater conditions were $0.151 \text{ kg h}^{-1} \pm 0.001$, $0.145 \text{ kg h}^{-1} \pm 0.004$, $0.154 \text{ kg h}^{-1} \pm 0.003$ simultaneously at 25.84% solar collector efficiency. Results indicated that the fabricated multi-crop hot air solar dryer is an effective method of conversion of solar radiation to thermal energy. Further improvements are required to increase the solar thermal efficiency of the multi-crop hot air solar dryer.

Keywords: Hot-air drying, Multi-crop, Solar drying