

### **Design and Development of a Prototype Pyramid-Shaped Solar Dryer**

**Sathurshiya. J<sup>1\*</sup>, Chandrathilaka, R.A.L.K.<sup>1</sup>, Jayasundara, J.M.Y.<sup>1</sup>, Rathnayake, H.A.<sup>1</sup>**

<sup>1</sup>*Department of Food Technology, Faculty of Technology,  
Rajarata university of Sri Lanka*

*\* sathurshiya0606@gmail.com*

Solar drying is considered as a cost effective and environmentally friendly technique that is commonly practised for dehydration of agricultural products. Current study was focused on the development of a prototype solar dryer with a pyramid shape for increasing the drying efficiency. Four triangular-shaped (35 cm high and 25 cm length) glass pieces (thickness of 3 mm) were cut and bound into a pyramid shape, and an exhausted fan was fixed at the top corner of the pyramid. By removing humid air and bringing in fresh air, it can aid in maintaining ideal drying conditions. A box-shaped cabinet was made using wooden planks (25×25 cm), painted black and the interior was wrapped using an aluminium foil. A solar collector was attached to the rectangular-shaped (90×40 cm) black-painted wooden board with an aluminium tube attached on the board and it was covered with glass. Aluminium tubes are commonly used in solar collectors' heat transfer systems to efficiently capture solar energy by circulating heat-absorbing fluids or gases. Finally, an Arduino board was programmed to automatically switch-on the exhausted fan when the temperature inside the dryer was increased more than 65°C. Besides, a solar collector attached to the dryer may also contribute to absorbing solar energy, that will ultimately heat the air that passes through the dryer. The convective heat transfer within the dryer caused the moisture in food products to evaporate. The drying efficiency within the fabricated pyramid-shaped solar dryer was compared with hot air oven and direct sun drying methods. The moisture content, colour and weight loss of carrot samples dehydrated with the three methods were analysed. The carrot sample dried within the fabricated solar dryer showed higher lightness ( $52.76 \pm 0.08$ ), and reached the safe moisture content of 3% within a lower period than the other methods. The drying peaked at noon (12 to 1.00 pm) and the moisture content of the was decreased to 3.3 % within 5 hours. Thus, the fabricated pyramid-shaped solar dryer imparts an effective and sustainable food dehydration system that preserves the colour of fresh produce.

**Keywords:** *Drying; Solar dryer; Arduino; post-harvest losses*