

Drying of onion slices in solar tent dryer

P.S. BANDGAR, S.A. MEHETRE AND J.S. GHATGE

Received : 10.01.2013; Revised : 03.03.2013; Accepted : 23.03.2013

See end of the Paper for authors' affiliation

Correspondence to:

P. S. BANDGAR

Department of Renewable Energy Sources, Padmashree Dr. D.Y. Patil College of Agricultural Engineering and Technology, KOLHAPUR (M.S.) INDIA
Email : psbandgar@gmail.com

■ **ABSTRACT** : The experiment was conducted to study this drying of onion slices in solar tent dryer designed by D.Y. Patil College of Agricultural Engineering and Technology, Kolhapur. The minimum temperature was 35.5°C at 8:00 am while maximum temperature attained in solar tent dryer was 54.3°C at 02.30 pm. Solar radiation received was increased from 300 W/m² to more than 900W/m². The initial moisture content of fresh onion slices were taken for drying was 84.7 per cent which was reduced to 11.13 per cent (wb) in three days drying period, whereas open drying required five days. Cost analysis revealed that the cost of dried onion slices was Rs.90/- per kg and break-even point was 85.45 per cent. Payback period was 2.24 years. The profit of solar tent dryer was found to be Rs.2005.24/-

■ **KEY WORDS** : Solar tent dryer, Onion slices, Solar radiations

■ **HOW TO CITE THIS PAPER** : Bandgar, P.S., Mehetre, S.A. and Ghatge, J.S. (2013). Drying of onion slices in solar tent dryer. *Internat. J. Agric. Engg.*, 6(1) : 157-161.

Solar drying is the best alternative as a solution to all the drawbacks of natural drying and artificial mechanical drying. Solar dryers are used in agriculture for food and crop drying. For industrial drying process, dryers can be proved to be most useful devices from energy conservation point of view. Open sun drying has several disadvantages like spoilage of product due to adverse climatic condition like rain, wind, moisture, dust, loss of material due to birds and animals, deterioration of the material by decomposition, insects and fungus growth. Also the process is highly labour intensive, time consuming and requires large area. With cultural and industrial development artificial mechanical drying came in to practice. It not only saves energy but also saves lot of time, occupying less area, improves quality of the product, makes the process more efficient and protects environment. Solar dryers consist of a transparent panel above a chamber or collector that is painted black to absorb the sun's heat. Polythene, which is very cheap, is commonly used to glaze the panel but it turns yellow and opaque after a few months and needs to be replaced. Plastic films that are not damaged by sunlight are now increasingly available and should be used if possible. While more expensive they have a life of 5 years or more. Tent solar dryers are cheap and simple to build and consist of a frame of wood poles covered with plastic sheet. Solar tunnel dryer becomes popular due to considerable reduction of drying time and significant improvement of product (Chaw *et al.*, 1997). It has been used to dry fruits,

vegetables, root crops, medical plant and fish (Gahur, 1998). Tent dryers provide protection against rain, insects and dust. Assembling and dismantling of this solar tent dryer is very easy with help of clips and require very less time. The performance and techno-economic feasibility was tested for drying of onion slices in the present study.

■ METHODOLOGY

The experiment of drying of onion in solar tent dryer was conducted in college campus at, Pad. Dr. D. Y. Patil College of Agricultural Engineering and Technology, Talsande, Dist. Kolhapur.

■ DYP solar tent dryer :

The solar tent dryer was designed and fabricated in the Department of Renewable Energy Sources, Pad. Dr. D. Y. Patil College of Agricultural Engineering and Technology, Talsande, Dist. Kolhapur having 10 kg capacity. The design parameters were decided on the basis of quantity of moisture removed per day (Seveda *et al.*, 2004).

The salient features of solar tent dryer are given below

- It is tent shaped type and has base area of 1.82 m x 0.91m and maximum ceiling height of 0.762 m. Low cost materials possessing high rigidity, long life and superior thermal characteristics have been used for construction.
- The metallic frame structure of the tent dryer has been