

Research Paper :

Experimental investigation of solar tunnel dryer for drying prawns

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ABSTRACT

Fish has usually played an essential part in man's diet. The production of dried fish and preparation of value added products from low cost fish will have great prospects in near future. The solar dryer may be the best viable option for drying of fish using the abundantly available free solar energy in the region. The objective of this study was to evaluate the performance of solar tunnel dryer. The comparative performance revealed that fish attained safe moisture limit in 18-28 hours in solar tunnel dryer as compared to 34 hours in open sun drying, the moisture content reduced from 344.86% d. b. to about 19% d. b. The average drying efficiency of fish dried by solar tunnel dryer was found about 18% higher than the open sun dried fish. The solar tunnel dried fish was found of better organoleptic and keeping quality upto 3 months.

Key words : Tunnel, Dryer, Fish, Drying time, Drying efficiency

Fish has usually played an essential part in man's diet, in all periods and all levels of technological progress. Fish is a good source of readily digested high quality animal protein. Fish proteins occupy an important place in human nutrition, as they have high digestibility, biological value and growth promoting value. Fish contains lysine and sulphur containing amino acids which complement cereal based diets. Most fishes contain 15-25 % protein and 1-5 % fat. Fish is a good source of vitamin A, D and B. Fish contains high polyunsaturated fatty acids specially omega-3 which can be important in lowering blood cholesterol levels and refreshes brain cell membrane. Nutritional studies have proved that fish proteins rank in the same class as chicken protein are superior to milk, beef protein and egg albumen. The production of dried fish and preparation of value added products from low cost fish will have great prospects in near future.

The conventional method of fish drying causes the loss of material and quality of the product and requires large time during the drying and hence, reduces the cost of final product. The solar dryer may be the best viable option for drying of fish using the abundantly available free solar energy in the region.

Condori *et al.* (2001) designed and tested a forced convection greenhouse drier with plastic greenhouse cover, a drying tunnel made with transparent plastic walls, trays and an electrical fan that moves the hot air from the greenhouse into the tunnel. A linear relation between the drier temperature and the solar radiation was obtained. Abedin *et al.* (2007) developed and constructed solar tunnel dryer with transparent foil covered flat plate

collector, drying tunnel, two d.c. fans powered by 40 watt solar cell module for drying fishes, vegetables and fruits. The moisture removal rate with solar tunnel dryer and open sun drying was observed as 120.96 g/hr and 65 g/hr, respectively for drying jackfruit juice. In present investigation the drying characteristics of solar tunnel dried prawns were evaluated in relation to open sun drying method.

METHODOLOGY

Construction of dryer:

The present study was undertaken at the Department of Electrical and Other Energy Sources, College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra State (India) during the year 2008-09. The solar tunnel dryer mainly consisted of a cover of U.V. stabilized polyethylene sheet of 200 μ m fixed on the cladding material with the help of zig-zag springs. The dryer was large enough that one can enter inside to load and unload the raw fish to be dried. The floor of the solar tunnel dryer was constructed with cement concrete and painted black for absorbing more solar radiation to increase the temperature inside the dryer. The supports for chimney, door and exhaust fan were welded. The north wall was placed at north side of solar tunnel dryer to minimize energy loss. Isometric view of solar tunnel dryer has been shown in Fig. 1.

The technical specifications of solar tunnel dryer for fish are given in Table 1.