

Development and performance testing of multi-reflector box type low cost solar cooker

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ABSTRACT

The higher cost incurred in box type solar cooker is one of the main barrier in efficient utilization of abundantly available solar energy. In order to reduce the cost of box type solar cooker a low cost multi reflector box type solar cooker was developed at College of Agricultural Engineering and Technology, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli. The multi reflector (Four) solar cooker was developed by using 10 mm and 4 mm plywood sheets having overall dimensions of 38 x 38 x 13 cm. The insulations of 12 and 15 mm thickness were provided using glass wool along the sides and at the bottom, respectively. The Aluminium foil on 4 mm thick smooth plywood or acrylic sheet was used as the reflectors. The reflectors were hinged to the sides of box cooker and their relative position with respect to direction of sunrays was adjusted with the help of well crew strips / sticky strips arrangement. The cooker was tested for stagnation temperature and in terms of cooking test in the month of October at Dapoli (latitude 17°45'N, longitude 73°26'E and at an altitude of 250 m from MSL) in a Konkan region of Maharashtra. The average time required to cook 200 gm rice (with 465 ml water) and 100 gm lantin dal (with 320 ml water) were 3 hr and 3 hr and 10 minutes, respectively. The water heated to 96°C in 2 hr and 35 minutes. The quality of cooked rice and dal were found acceptable for human consumption.

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In multi reflector cooker with four square or triangular or rectangular reflectors are mounted on the cooker body. They all reflect the solar insulations into the cooking zone in which cooking utensils are placed.

Temperature obtained is of the order of 200°C, (Rai, 1984). The higher cost incurred in box type solar cooker was one of the main barrier in efficient utilization of abundantly available solar energy. In order to reduce the cost of box type solar cooker, a low cost multi-reflector box type solar cooler was developed at College of Agricultural Engineering and Technology, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli. The cooker was tested to cook rice and dal and to boil water at Dapoli to know its performance in the region.

METHODOLOGY

The multi reflector box type low cost solar cooker was designed and fabricated as per the specification given below and shown in Fig. 1.

Cooker body:

The overall dimensions of cooker body *i.e.* of box were 38 x 38 x 13 cm. The outer box was made from 10 mm thick plywood sheet. The inner box having overall dimension 35.6 x 35.6 x 11.5 cm made up of 4 mm thick plywood sheet was fitted inside the outer box. The gap between two boxes was filled with glass wool to prevent

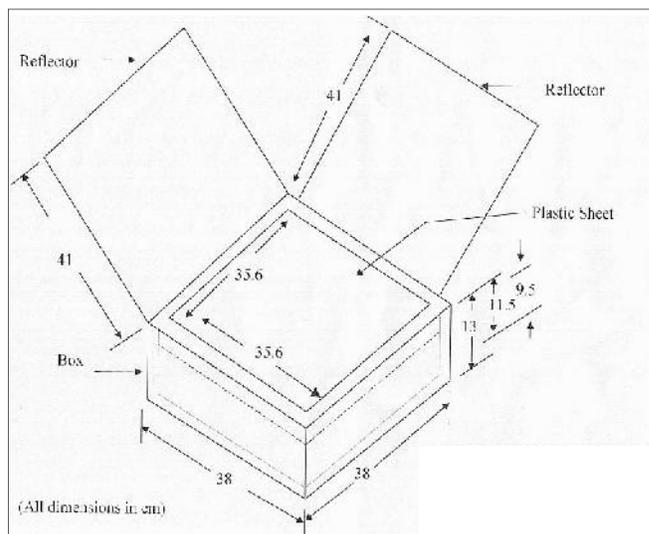


Fig. 1: Multi reflector box type low cost solar cooker

heat losses due to conduction. The transparent UV stabilized plastic sheet of 0.25 mm thickness, attached to rectangular frame made from 8 mm thick wooden strips having overall dimensions 35.5 x 35.5 cm, was used to cover the box. The wooden frame was fixed into the box with the help another permanent support frame provided at a depth of 2 cm from the top edge of the box. The rubber strip of 3-4 mm thickness was fitted on the support frame to make the box airtight.