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Design and Fabrication of Raisin dryer using Solar Powered Air Blower

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Abstract*: This project describes the drying of grapes using a solar powered air blower and a heating module (peltier chip) .The preparation and maintenance of grapes has been considered to be a major complex issue for a long time. In order to achieve more product and higher marks and achieve customer satisfaction more attention is given to quality features. Quality factors including color, size, taste were very important as they would differ from the dehydration process. This project is used to reduce drying time by using solar energy. Solar power plants are important in the tropics, which face challenges in accessing electricity, which severely limits the refrigeration usage as storage of agricultural products is limited, and the need to make products competitive overseas. In this project, the solar energy used to dry food is described; it is thought that hot weather conditions are favorable during the summer season. A DC drive for suction fan operation is used to send atmospheric air into the system and the air temperature is increased using a peltier chip placed in the air. DC's utility system is powered by a battery charged with the help of solar panels and electricity supply. It works well that the design will be able to shorten the final product time rather than the traditional method.

***Keywords* : Grapes drying, Raisin drying, Solar drying.**

I. INTRODUCTION

In India grape cultivation covers 79.6 thousand hectares with an production of 1878.3 thousand tons annually. Of that annual production is made only a small amount is made from grapes and the rest is used for different purposes and is sold fresh grapes. Like most popular fruits, grapes can also be eaten directly. Fresh grapes after harvest have a high humidity and sugar content that excels and is energetically inspired. Hot drying is one of the most commonly used dried grapes. It can process grapes in the raisin for longer shelf life and used as fruit for wine or juice production. In addition, drying can bring other benefits such as a significant reduction in weight and volume, reducing packing, storage and travel costs. Drying methods and conditions also have a

negative effect on the final product release. Grape drying, different drying methods have a impact on their drying time. Therefore, grape storage and nutritional content throughout the drying process must be maintained. By considering raisin, pre-treatment is similar to the previous chemical and physical treatments to remove the wax layer over the outer grapes and improves the rate of dryness. In the meantime, natural drying and shade drying are still the most common ways of drying grapes. It has several pitfalls. As a long dry period of more than two weeks, the recycling products caused by bad weather, dust pollution and insects. Therefore, the use of the right drying technology is essential for the production of good raisins.

II. EXPERIMENTAL SETUP

The setup consists of a blower, container, heating element, aluminum foil and GI pipe. First the blower is connected to GI pipe having the heating element inside them pipe. The air from the blower carries the heat from the heating element to the container. The heating element and the blower speed are adjusted in order for constant temperature. Aluminum foil is wrapped around the GI pipes in order for more heating. With the help of the hot air the drying process is carried out. Solar power along with electric power is used for operating the setup.

III. PROCEDURE

First the fresh grapes are taken and then treated in ethyl oleate solution as a pre-treatment. This solution makes the wax on the outer side of the grapes to be removed. The wax is removed because it makes the drying progress very slow and at the same time the wax is not useful for raisins. After the pre-treatment process the grapes are taken in trays as required levels and placed inside the container. Then the setup is placed in a sunny area where the solar power from solar panel powers the air blower and the peltier chips. The blower blows the air inside the pipe and inside the pipe there placed the chips which in turn produces heat. Thus the air is heated with the help of chip and forced into the container full of grapes. This process is carried out until the grapes are dried out to form raisin.

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IV. DESIGN AND VALUES

- *Container:*

  Length = 60 cm
  Width = 30 cm
  Height = 50 cm
  Volume of container = L * W * H = 60 * 30 * 50
  Volume of container = 90000 cm3
- Pipe:
  Length = 40 cm
  Diameter= 9 cm
  Volume of pipe = 3.14 * r2 * L = 3.14 * 4.52 *40
  Volume of pipe = 2543.4 cm3
- Motor:
  Width = 4 cm
  Length = 9.3 cm
  Operating voltage = 7V ~ 14V
  No load speed = 7000 rpm
- Solar Panel = 60 W panel
- Peltier Module:
  Input Voltage = 12 V
  Input Current = 5A ~ 10A
  Length = 4 cm
  Breadth = 4 cm
  Maximum heat Generation = 100`C
- Fan: 1045 propeller
  Slope = 11.43 cm
  Length = 25.4 cm
  Air flow = 2 * 3.14 * 0.127 * 5000 /60 = 66.43m/s
- Cone:
  Inlet diameter = 36 cm
  Outlet diameter = 9 cm
  Length 20 cm
  Airflow in cone = 0.5 * 66.43 = 33.21 m/s

V. COST ESTIMATION AND MODEL

Table 1: Cost Estimation

SL.NO	DESCRIPTION	COST Rs
1	SOLAR PANEL	3200
2	TEG	900
3	PLY WOOD	500
4	METAL FRAME	1200
5	ALUMINIUM SHEET	600
6	HOLLOW PIPE	300
7	D C MOTOR	400
8	BATTERY	1000
9	FAN LEAF	200
10	SPEED CONTROLLER	500
11	AC TO DC CONERTER	1200
12	MISCELLANEOUS	2500
13	TOTAL	12500

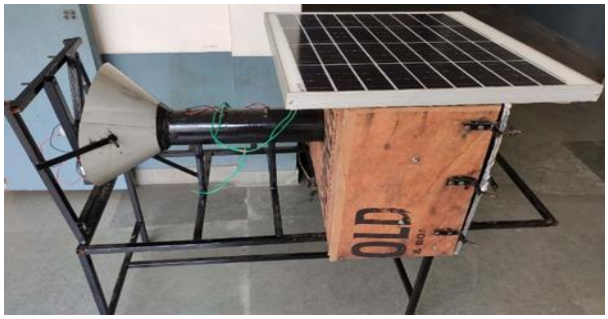

Fig 1 Fabricated model

VI. CONCLUSION

Solar energy is widely available and used in the drying process of agricultural products. As well as using solar energy the purpose is achieved as the temperature rises several degrees when the whole set runs under the sunlight. Solar power is converted into electrical energy and successfully runs on motor and peltier chips. The energy used to blow the air and produce heat. The atmosphere is heated to about 10 to 15 degrees by air temperature. Thus the air and cooler temperatures make the grape drying process as expected. If it is done on a large scale then it can be very successful to dry the grapes.

However, when the air temperature is low and during the rainy season, conventional sources of energy are used and achieve the same effect as drying the sun. Requires AC to DC adapter for its process. Even both sources of energy combined make the process much faster. So solar energy is effectively used for drying.

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