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SOLAR OPERATED BOILING AND DRYING MACHINE FOR TURMERIC

Prof.Deshmukh S.A. [1], Kamble Gangadhar[2], Khartode Abhijit[3], Dhapate Umakant[4], Kharade Rohan[5]

[1]Assi.Professor, [2,3,4,5]Students
Dept. of Mechanical Engineering, S.B.PATIL College Of Engineering, Vangali, Maharashtra,India

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Abstract

The after harvest unit operations for turmeric processing are boiling and drying carried out by conventional method which are slow, tedious and labour intensive.it losses are major problem of the worlds especially for developing nations where 25% of food is lost by mishandling, spoilage and pest infestation.Boiling and drying of raw turmeric rhizomes is essentially very important for development of an attractive yellow colour and aroma.solar energy is available in abundant amount in nature at free of cost. So, that we can use solar energy as option for non-renewable energy source.an appropriate technology for boiling and drying of turmeric was developed and was evaluated for the boiling and drying of turmeric rhizomes.It was observed that time required to reduced moisture content in turmeric from 79% to 10% in solar drying was 45 h while 59 h in open suns drying. Hence, it is recommended that the improved solar boiling and drying be used for turmeric processing.

Key words

turmeric rhizomes, solar boiling and drying, aroma, conventional

Introduction

Turmeric (Curcuma Longa L.) is one of the essential elements of the World. It has been used in India for thousands of years as both a spice and medicinal herb. Recently, science has started to back up traditional claims that turmeric contains compounds with medicinal properties.Turmeric mainly grown in the states of Tamil Nadu, Kerala, Maharashtra, Orissa, West Bengal and Northeastern states.

India is one of the leading countries in production of raw turmeric and other sub products related to turmeric. 76 % of the world turmeric production is in India. The common practices among turmeric growers for turmeric cooking are traditional methods, which involves cooking and drying. The basic principle is boiler is used for cooking of turmeric in pressure vessel and after that hot air is used for drying of turmeric. In conventional method time required of this entire process is about 15 days, and it is less efficient.There is need to develop design of boiler and pressure vessel and also dryer. Also some safety precautions are required to include. This paper reviews properties of turmeric and conventional method of turmeric processing and design analysis of boiler, pressure vessel, and dryer.

The post harvest processing of turmeric involves many units operations such as washing, cleaning, curing, drying, polishing, size reduction and packaging. Curing is the process of boiling the raw rhizome in water for the development of attractive colour and aroma. Boiling also destroys the viability of the fresh rhizomes,

Charts
reduces the raw odour and the time of drying.
These improved technology could be maintain the quality and hygiene of product, hence enhances the profit of farmer. Therefore, an appropriate technology for boiling and drying of turmeric was developed and evaluated for the drying of turmeric rhizomes.

Objectives

- To design a boiling & drying machine for turmeric cultivation which is reliable & user friendly.
- To address the problem of environment pollution.
- To develop a machine which makes boiling and drying of turmeric.
- To study and document the different traditional process used for turmeric processing in the state of Maharashtra.
- To work on eco-friendly and time reduction technology for conversion of form fresh turmeric rhizomes into dry concentrate.

what we studied:

The post harvest unit operations of turmeric like curing and drying carried out by conventional method were tedious and labour intensive. Attempt was made to develop an efficient machine solar boiling and drying which reduced drudgery, labour cost and maintained the quality of final product. The thermal efficiency of this machine was better than efficiencies of open fires and traditional stoves. The solar cabinet dried turmeric sample had higher colour value and higher curcumin content for better quality product

Material

1. SOLAR PANEL

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (in short PV) module is a packaged, connected assembly of typically 6×10 solar cells. Solar PV panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes a panel or an 22 array of solar modules, a solar inverter, and sometimes a battery and/or solar tracker and interconnection wiring. 5.4. 5) HEATING COIL: Fig 5.5 Resistors work by converting electrical energy to heat energy

2. 12volt 7amp Dc battery

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal.

1. HEATING COIL

Heating elements are typically either nickel-based or iron-based. The nickel-based ones are usually nichrome, an alloy (a mixture of metals and sometimes other chemical elements) that consists of about 80 percent nickel and 20 percent chromium (other compositions of nichrome are available, but the 80–20 mix is the most common). There are various good reasons why nichrome is the most popular material for heating elements: it has a high melting point (about 1400°C or 2550°F), doesn't oxidize (even at high temperatures), doesn't expand too much when it heats up, and has a reasonable (not too low, not too high, and reasonably constant) resistance (it increases only by about 10 percent between room temperature and its maximum operating temperature).

2. Nut bolt

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

3. POLYTHENE SHEET

Poly-methyl-meth-acrylate) (PMMA), also known as acrylic , acrylic glass, is a transparent thermoplastic often used in sheet form as a lightweight or shatter-resistant alternative to glass. The same material can be used as a casting resin or in inks and coatings, among many other uses. Although not a type of familiar silica-based glass, the substance, like many thermoplastics, is often technically classified as a type of glass (in that it is a non-crystalline vitreous substance), hence its occasional historic designation as acrylic glass. Chemically, it is the synthetic polymer of methyl methacrylate.

4. BOILING CHAMBER

In a storage battery having a plurality of pairs of terminals of readily fusible material, each pair of terminals having integral vertical riser portions having opposing flat surfaces, said riser portions sandwiching an electrical insulating vertical partition having a horizontal hole there through, each terminal also having a horizontal strap portion extending away from said partition and integral vertical riser portions; the method of making an intercell connection between each pair of terminals through the horizontal hole of the corresponding vertical partition, comprising applying a vertical insulating sheet against the outside of each of said vertical riser portions and applying an electrical induction coil adjacent the outside each of said sheets substantially concentric with said horizontal hole, squeezing together said sheets, pair of terminals and partition, and applying high frequency electrical current to said coils sufficiently as to partially fuse said riser portions in the vicinity of said horizontal hole of said partition and to fill said horizontal hole with fused metal of said riser portions, using said sheets, partition and vertical riser portions as dams to contain the fused metal, and 33 thereafter allowing said fused metal to cool and solidify so as to form a metallic connection between said pair of terminals

3. DRYING CHAMBER

The Solar conduction dryer is a solar powered fooddehydrator.The device utilizes solar power in a conductive manner as well as convective way for drying. The structure of solar conductive dryer which comprises of two drying chambers constructed from hollow sections of stainless steel. The dryer has two drying trays, covering a surface area of 1.04 m2 each. Transparent plastic (polythene Sheet) is used to cover the trays. The trays are coated with black color special food grade coating, where the products to be dried are placed. Two exhaust fans are provided at one side of drying chamber. These fans are connected to the inverter which supplies electricity to the fan which is generated by solar panel. Atmospheric air enters from the fans and it carries away the moisture of the sample trough it. Accesses to the trays are done by sliding the trays out in a designed channel for loading purpose.

ADVANTAGES

1. Safety and security
2. Saving of time, money and fuel
3. Environment-friendly and Systematic
4. It adopts rotating for mechanism so as to minimize the vibration and noise.
5. Flexible operation.
6. High safety, complete inspecting device
7. Stable and reliable

Conclusion

In this paper, study of solar boiling and drying machine for turmeric rhizomes. Also, develop an efficient machine solar boiling and drying which reduced drudgery, labour cost and maintained the quality of final product. The thermal efficiency of this machine was better than efficiencies of open fires and traditional stoves. The solar cabinet dried turmeric sample had higher colour value and higher curcumin content for better quality product

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