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DEVELOPMENT OF SOLAR DRYING SYSTEM FOR CROPS OF VIDARBHA REGION: A RIVIEW

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Abstract: Drying is one of the oldest methods of food preservation. Drying preserves foods by removing enough moisture from food to prevent decay and spoilage. Water content of properly dried food varies from 5 % to 25 % depending on the food. Successful drying depends on: Enough heat to draw out moisture, without cooking the food; Dry air to absorb the released moisture; and Adequate air circulation to carry off the moisture.

When drying foods, the key is to remove moisture as quickly as possible at a temperature that does not seriously affect the flavor, texture and color of the food. If the temperature is too low in the beginning, microorganisms may survive and even grow before the food is adequately dried. If the temperature is too high and the humidity too low the food may harden on the surface. This makes it more difficult for moisture to escape and the food does not dry properly. Although drying is a relatively simple method of food preservation, the procedure is not exact. A “trial and error” approach often is needed to decide which techniques work best. Drying, like all methods of preservation, can result in loss of some nutrients. Nutritional changes that occur during drying include: Calorie content, Fiber, Vitamin A, Vitamin C, Thiamin, riboflavin, niacin and Minerals

For best retention of nutrients in dried foods store in a cool, dark, dry place and use within a year. This proposal suggest the alternative option for drying of crop with the help of solar energy because power generated by solar energy is not just relatively simpler but is also much more environmental friendly compared power generation using non renewable sources like fossil fuels and coals.

Keywords: Food Preservation, Moisture, Environment, Power Generation

I.PROBLEMS IDENTIFIED

Turmeric goes through two step post harvest process viz. boiling and drying. The turmeric rhizomes are boiled to prevent germination by conventional way using wood, natural gas etc. in a large container post which it is dried in the sun for a period of 20-25 days to make sure that the crop is moisture free before it is pulverized into powder form. Red chili requires only drying. Chili crop is usually planted in *kharif* months of August- September. The plants start bearing fruit in month of November. The produce is collected every seven days till the month of April and kept for drying in sun simultaneously to make the crop moisture free. As with turmeric, chilies also require 20-25 days of drying in sun. First being the dependency on solar heat for drying. With so much of chilies produced every week it becomes cumbersome for farmers to garner the chilies spread under the sun during the day each night and spread them again next day. We found that farmers let the chilies once spread as it is for 25 days. This means the produce is affected by moisture in night and dust which can form a thin layer on the produce. For drying, space is required which in this case is used up for 25 days. The post harvest process of boiling turmeric makes the crop lose its nutrients, the use of firewood for boiling depletes natural resources and the smoke that is produced harms the environment.

II.Literature survey on National & International scenario

Literature review no 01: *Post harvest profile of chilli* government of india, ministry of agriculture, (department of agriculture & cooperation) directorate of marketing & inspection branch, head office, nagpur 2009 .This paper has given given detailed idea about major chilli producing countries in india and subsequently about the states in India.This paper also given detailed adea about no. of districts producing chilis. The top 10 chilli producing countries, India, China, Ethiopia, Myanmar, Mexico, Vietnam, Peru, Pakistan, Ghana and Bangladesh. The top 10 chilli producing countries, India, China, Ethiopia, Myanmar, Mexico, Vietnam, Peru, Pakistan, Ghana and Bangladesh.Major Chilli producing States in India in year 2006-07 are:Andhra Pradesh(57%), Karnataka (12%), Maharashtra (3%), Madhya Pradesh(4%), Orisa (5%) and others(14%).The district producing chillis in Maharashtra are: Nagpur, Nasik, Ahmednagar, Sholapur, Aurangabad Nanded Lasalgaon Amravati, Dhulia, Chandrapur, JalgaonAnjangaon, Morshi, Dandaichi, Chimur, Amainer, Achalpur and Sangli.

Literature review no 02: Effect of Pretreatments on Quality Attributes of Dried Green Chilli Powder Ajaykumar , Jadhav Sandeep L and Bhotmange Madhukar - ISCA Journal of Engineering Sciences- ISCA J. Engineering Sci.,Vol. 1(1), 71-74, July (2012). Chilli (Capsicum annuum L) known for their sharp acidic flavor and color was processed in to powder and evaluated for its chemical attributes. The chillies of two different verities (Tejas and NP-46) were blanched in hot water at 900C for 3 minute and given horizontal cuts of 1cm in order to improve the drying rate after blanching. These cuts of chillies were pretreated with the solution containing 1% ascorbic acid, 0.3% sodium metabisulphite, 0.3% sodium metabisulphite and 1% calcium chloride after blanching by giving 10 minute soaking in above solutions. The ratio of the green chilli: pretreatment solution is 250 g: 1 Liter followed by surface drying at 600C and 700C; then ground to make a fine powder. Green chilli powder yielded from Tejas variety has shown more green color as compared to NP-46. Using NaMS at drying air temperature of 600C provided more bright green color. The green chilli was examined chemically as well as morphologically for its suitability for powder processing. It was found that the green chilli powder yielded from Tejas variety has shown more green color. In order to obtain aesthetic or acceptable color value and minimum nutrient losses in green chilli powder the pretreatment of NaMS combined with the CaCl2 can be used with drying temperature of 600C excluding one or two contradictory results.

Literatures review no 03: Influence of pretreatments on drying rates of chili pepper *(Capsicum annum* L.*)* R. Muhidin1* and O. Hensel- The aim of this work was to investigate the influence of pretreatment on drying rates of chili pepper *(Capsicum annum* L.) at various air temperatures and pretreatment methods. Chilies were pretreated mechanically, chemically as well as by a combined form before drying. The changes of moisture content were determined experimentally at temperatures of 35^0, 50^0, 60^0, 70^0, and 90^0 for pretreated and untreated red chilies. untreated chillies. Increasing the drying temperature from 35^0 to 50^0 shortened the total drying time by 72% for untreated chillies. 8 At a constant temperature, the pretreatment of chilies was able to achieve much shorter drying time than the one of the untreated ones. At a temperature of 50^0 both blanching and hole making method reduced the drying time by 29.6% compared to the untreated samples. At a temperature of 60^0 hole making method shortened the drying time by 48% compared to the untreated method. Generally pretreatment method by making small holes provides much shorter drying time than the all types of methods used at all temperatures

Literature review no 04: Solar-Energy Drying Systems, Feyza Akarslan, *Department of Textile Engineering, Engineering and Architectural Faculty,, Süleyman Demirel Univercity, Isparta, Turkey*: the use of solar dryer leads to a considerable reduction of drying time in comparison to the sun drying, and the quality of the product dried in the solar dryer was of quality dried products as compared to sun dried products. The agreement between the experimental and simulated moisture contents was found to be good. overall higher efficiency of the solar tunnel dryer compared to natural convection solar dryer was due to the fact that the solar tunnel dryer operated as a forced convection solar dryer and the drying unit received energy from both the collector and incident radiation.

Literature review no 05 : Ekechukwu O. V., 199, Review of solar energy drying system : An overview of drying principles and theory, Energy conversion & Management. According to this author, India receives an enormous amount of solar energy : an average, of the order of 5 kWh/m^2 day for over 3002days/year. This energy can be used for thermal or electrical applications. Thermal drying, which is most commonly used for drying agricultural products, involves vaporization of moisture within the product by heat and its subsequent evaporation from the product. Thus, thermal drying involves simultaneous heat and mass transfer.

Literature review no 06 : A Comparative study of commonly used Solar Dryers in India Garima Tiwaria, V. K. Katiyara, Vivek Dwivedia, A. K. Katiyarb and C. K. Pandeyb, International Journal of Current Engineering and Technology ISSN 2277 – 4106 the solar tunnel dryer and solar hybrid dryer are more suitable because of higher efficiency, commercial viability, high load capacity and higher drying rate. By using solar hybrid dryer drying time can be reduce and the major advantage of both dryers is that it can be used for multi crops. Quality of dried product also found to be best.

Literature review no 07 : A Comparative study of commonly used Solar Dryers in India , Garima Tiwaria, V. K. Katiyara, Vivek Dwivedia, A. K. Katiyarb and C. K. Pandeyb, International Journal of Current Engineering and Technology ISSN 2277 – 4106 the solar tunnel dryer and solar hybrid dryer are more suitable because of higher efficiency, commercial viability, high load capacity and higher drying rate. By using solar hybrid dryer drying time can be reduce and the major advantage of both dryers is that it can be used for multi crops. Quality of dried product also found to be best.

Literature review no 08: R. Smitabhindu, S. Janjai and V. Chankong, "Optimization of a solar-assisted drying system for drying bananas", Renew Energy, vol. 33, **(2008)**, pp. 1523-31. There are several basic kinds of solar thermal power systems including "flat plate" solar water heaters; concentrating collectors, such as central tower receivers; and parabolic trough and dish collectors

Literature review no 09: J. PB and D. GI, "A probabilistic method for calculating the usefulness of a store with finite energy capacity for smoothing electricity generation from wind and solar power", Journal of Power Sources, vol. 162, **(2006)**, pp. 943-8. Drying under controlled conditions of temperature and humidity helps the agricultural food products to dry reasonably rapidly to safe moisture content and to ensure a superior quality of the product

Literature review no 10: Esper A, Mulhbauer W. Solar drying – an effective means of food preservation. Renew Energy. 1998;15:95-100. The use of the sun under the open sky for drying
agricultural crops has been in practice since ancient years. The products under the open drying are of
poor quality due to the unavoidable presence of rain, wind, moisture and dust. Also, they are attacked by insects and fungi among others.

Literature review no 11: Forson FK, Nazha MAA, Akuffo FO, Rajakaruna H. Design of mixed- mode natural convection solar crop dryers: Application of principles and rule of thumb. Renewable Energy. 2007;32:2306-2319. In rural areas, different constructions of active solar dryers are hindered due to lack of conventional power.

Literature reviews no 12: Boiln HR, Salunkhe DK. Food Dehydration by Solar Energy, CRC Critical Reviews in Food Science and Nutrition, April. 1982;:327-354. :→ Acceleration of drying rate can occur in two ways: hot air can transfer some of its heat to the product being dried, thus raising its vapour pressure causing a faster moisture loss; or as temperature of air mass increases, the water-holding capacity also increases.

III.REFERENCES

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03: Influence of pretreatments on drying rates of chili pepper *(Capsicum annum* L.*)* R. Muhidin1* and O. Hensel

04: Solar-Energy Drying Systems, Feyza Akarslan, *Department of Textile Engineering, Engineering and Architectural Faculty,, Süleyman Demirel Univercity, Isparta, Turkey*

05 : Ekechukwu O. V., 199, Review of solar energy drying system.

06 : A Comparative study of commonly used Solar Dryers in India Garima Tiwaria, V. K. Katiyara, Vivek Dwivedia, A. K. Katiyarb and C. K. Pandeyb, International Journal of Current Engineering and Technology ISSN 2277 –4106

07 : Garima Tiwaria, V. K. Katiyara, Vivek Dwivedia, A. K. Katiyarb and C. K. Pandeyb, International Journal of Current Engineering and Technology ISSN 2277 – 4106

08: R. Smitabhindu, S. Janjai and V. Chankong, "Optimization of a solar-assisted drying system for drying bananas", Renew Energy, vol. 33, (2008), pp. 1523-31

09: J. PB and D. GI, "A probabilistic method for calculating the usefulness of a store with finite energy capacity for smoothing electricity generation from wind and solar power", Journal of Power Sources, vol. 162, (2006), pp. 943-8.

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