COMPARATIVE ANALYSIS ON GREEN HOUSE DRYER WITH MODIFIED DOUBLE CHAMBER GREEN HOUSE DRYER FOR AGRICULTURAL PRODUCT

[1]Dharmendra kumar Patel, [2]Dr. Ajay Singh, [3]Prof. Ashish Verma

Department of Mechanical Engineering
Radharaman Institute of Technology and Science, Bhopal, M.P., India.

***Abstract*: Drying using burning of fossil fuels and open sun drying are traditional way to dry crops, fruits, vegetables etc. But there are some disadvantages associated with them such as crops are affected by dirt and other impurities. To overcome the problems associated with open sun drying and drying using burning of fossil fuels, solar greenhouse drying is found out to be the best alternative. In present work the performance of simple and modified double chamber greenhouse dryer is evaluated and effort is made to increase the drying rate of greenhouse dryer which has been achieved in modified greenhouse dryer top chamber and bottom chamber with inclined roof. Total weight of potato flakes was reduced by 77 % in modified greenhouse dryer in top chamber, reduced potato flakes in bottom chamber 68 % , greenhouse dryer of potato flake reduced by 72 % and in open dryer flake reduced by 66 % just in 5 hours whereas it took 6 hours in simple greenhouse dryer for achieving nearly same values.**

***Keywords*: Greenhouse Dryers, Drying Potato, MGHD Double Chamber**

Introduction

Potato is that the one in all the for the foremost half created vegetable in world. As indicated by FAOSTAT Republic of India is one in all the most effective most manufacturers of potato on the world. Creation of potatoes once a year is increasing at faster rate in Republic of India furthermore as entire world sachin vinayak et al.[1]. In India potatoes ar used as a locality of diverse structures in day by day life, as an example, chips, vegetable and additional a lot of in fast nourishments. For utilization systematically, crops ar ought to be place away and safeguarded for extended time. As a results of higher creation rate and absence of golf shot away workplace assembling misfortunes could happen. it's necessary to reduce post assembling misfortunes for golf shot away the yield for quite whereas used. to safeguard the harvest and vegetables daylight primarily based drying is one amongst the temperate and most ideal thanks to day jain D. et al.[2].

In earlier times drying was done in the openly in sun, but today to dehydrate the foods dryers are used. Hot air is circulated over the products. Hot air heats up the product which is subjected to be dry and conveys released moisture to atmosphere. The product is heated directly by sun's rays in direct and removal of moisture is possible by natural circulation of air due to density differences. In solar crop drying, both heat and mass was simultaneous transferred prakash o. Et al.[3]. Drying method involves reduction in volume. Crops could dried in sliced or quarter and also in their entireness. several analysis are in hot water analysing the greenhouse appliance performances below natural convection mode for various crops and that they found that as compared to open sun drying, higher results ar obtained in greenhouse appliance. reviewed on completely different drying techniques and differing types of star dryers for crops drying Fuller r.j et al.[4].

Aim:- It is studied that many researchers have worked in the field of greenhouse dryers under natural convection mode. The aim of present work is to make a low cost natural convection greenhouse dryer with improved drying rate. Effect of ambient parameters i.e. solar radiation, temperature, wind velocity and relative humidity on the drying rate of greenhouse dryer is also presented.

2.0 Material and Methods

2.1 Experimental setup-

The proposed nursery dryer is of slanted roof top even sort which is made of rectangular iron funnels and straight forward plastic film. The base surface of the dryer is stuffed by dark plastic with black coated aluminium plate. The top of the dryer is slanted to scope of Bhopal i.e. 23° N. The first drying plate is made of wire work with a successful region of 94 × 58 cm². And parallel second drying plate of 90 × 50 cm^2 for stream of air inside the dryer two round about openings of 10 cm breadth are given underneath the plate position. Also, for air outlet rectangular gap is given on top side of inverse divider. To look at the consequences of this changed nursery dryer one straight forward nursery dryer is additionally made with same measurements a side from the roof top tendency. Every one of the parameters were set same concerning slanted rooftop nursery dryer. Fig. 1(a) and Fig. 1(b) Demonstrates the instruments utilized and trial setup individually.

Fig.1 (a): Instruments used

Fig.1 (b): Experimental setup

Instruments Used

For measurement of solar intesity solar power meter TM-207, for temperature measurement six channel digital indiator DTI-101 with J- Type thermocouple, for measurement of relative humidity calibrated humidity meter HT-305, for measurement of wind velocity digital anemometer AM-4201 and a digital weighing machine of top loading were used.

Materials

Fresh potatoes of in quantity of 3 kg were procured from local market of Bhopal. Dirt from skin of potatoes was removed by washing. After that potatoes were cut into flakes of 2 to 3 mm thickness. For drying equal quantities of potato flakes were kept on the wire mesh of both dryers and on black coated aluminium sheet.

Drying Procedure

The drying of potato flakes is performed in open sun drying, simple greenhouse dryer and modified greenhouse dryer double chamber under natural convection modes Patel D.K. et al.[7]. The proposed model is constructed and installed at Radharaman Group of Institutions, Bhopal (23.1° N 77.3° E), India. The experiment is performed between 10 AM to 4 PM on 25 July 2018. The dryer is kept on the ground and far from shade of the trees and buildings. All the experimental observation is taken out on hourly.

3.0 Result and Discussion

To understand the performance and drying behaviour of any dryer the ambient parameters such solar radiation, atmospheric wind, atmospheric temperature plays very important role.

3.1 Effect of solar radiation

The variation of solar radiation with respect to time. On the day of experiment the solar radiation varied from 950 W/m² to 1250 W/m²

m². Fig. 2 shows variation in temperature at various indicated locations with time.

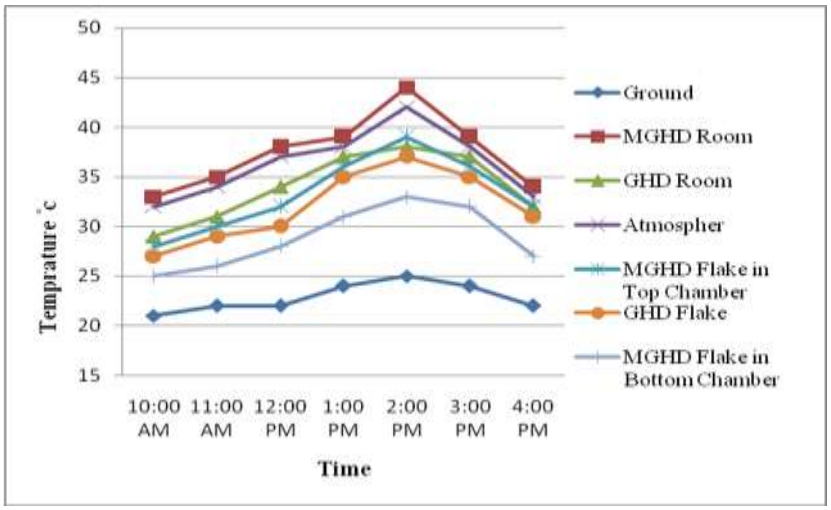

Fig. 2: Variation in temperature with time

From Fig.2, it is seen there is direct effect of solar radiation on temperature. When the solar radiation increases, the temperature also increases. Also fall in temperature was observed when solar radiation decreases. It was observed that the temperature of ground was always higher than temperature of potato flakes, atmospheric, GHD room and MGHD room. Also the MGHD room temperature is found to be always higher than GHD room temperature which provides faster drying. The potato flakes temperature increases slowly at initial stage but later it increases suddenly Tiwari G.N. et al.[5]. This is because during initial stages free moisture on the surface of potato flake escapes at faster rate leading to temperature drop in them. The temperature of crop is nearly constant as moisture is removed during final stages.

3.2 Effect of relative humidity and atmospheric wind velocity

Fig. 3 shows the variation in relative humidity with time. The atmospheric relative humidity varies from 53.1 % to 45.6 %. The MGHD top are bottom chamber must in inclined relative humidity varies from 47 % to 43.4 %. The GHD relative humidity varies from 50 % to 45 %. It can be observed that relative humidity of MGHD is always less than GHD relative humidity. There is small variety in relative humidity of the 2 dryers. Relative viscosity in each the drier is more than air relative wetness amid introductory stage i.e. around eleven AM and twelve PM. the reason for this may be that amid drafting board due to hot temperature and free wetness on the merchandise surface the humidity within the drier increments and it's exhausted by traditional convection of air. Therefore the humidity within the drier is a few what higher amid beginning stages Gbaha P.et al.[6]. It is realized that the hot air ascends because of low thickness. In MGHD due to high temperature of room and rooftop tendency the soggy air moves upward, down ward and takes dampness away by characteristic convection. Due to this it's perpetually watched that relative humidness of MGHD area is consistently not specifically in GHD area relative damp. it's likewise watched that the relative damp of MGHD and GHD area is ascertained to be least amid last stages. On account of common convection the dissemination of air within the appliance is less with the goal that the temperature inside the dryer was found to be high and because of such high temperature relative mugginess inside the dryer was less amid last phase of drying.

Fig. 5 demonstrates the variety in environmental breeze speed with time. The environmental breeze speed fluctuated from 0.3 m/s to 0.9 m/s. Due to normal convection, the channel and leave wind speed and dampness evacuation rate relies on the barometrical breeze speed. The breeze speed likewise influences the temperature of barometrical, GHD and MGHD room. It is watched that when the air wind speed was high there was little decrease in air, GHD and MGHD room temperature Goyal et al.[8].

Fig. 6 demonstrates the weight diminishment of potato chips with time. It can be seen than the dampness expulsion by MGHD is speedier than GHD. Likewise amid last stages, it is discovered that the heaviness of the dried potato pieces in MGHD top chamber is 300 gms and bottom chamber is 344 gms at 4 PM though in GHD it was 330 gms and in open sun drying it was 350 gms. The drying in MGHD is observed to be quick as contrast with GHD and open sun drying.

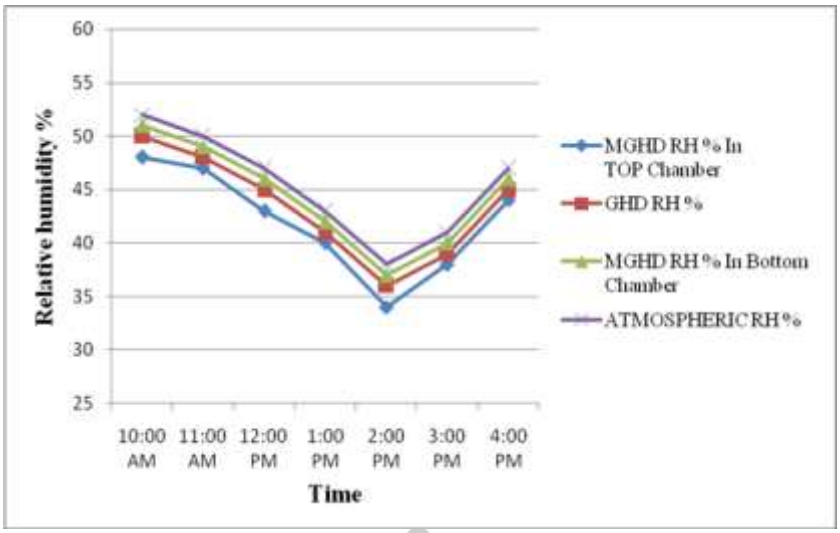

Fig. 3: Variation in relative humidity with time

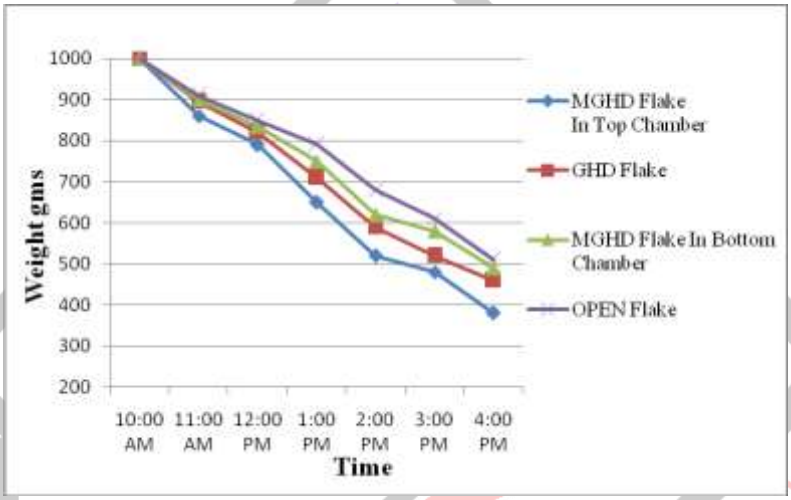

Fig. 4: Drying curve for different mode of drying

(a)

(b)

(c)

(d)

(a) MGHD dried potato flakes in Top Chamber
(b) GHD dried potato flakes
(c) OPEN dried potato flakes
(d) MGHD dried potato flakes In Bottom Chamber

3.3 Visual appearance of dried potato chips:-

The potato chips dried in GHD look superior to straight forwardly sun drying process. In both the dryers the potato pieces are observed to be free from any earth and pollutions while in straight forwardly dried potato drop visual appearance was bad likewise it contains soil.

4.0 Conclusion

The crops dried in open sun suffer from addition of dust and other things whereas crop dried in solar greenhouse dryer are free from impurities.

1. The excessive temperature is observed found for MGHD and then for GHD. Also less relative humidity is found for MGHD and then for GHD.
2. Both of the dryers provide better condition.
3. Total weight of potato flakes in top chamber was reduced by 77 % and bottom chamber flake reduced by 68 % was in MGHD whereas in GHD it was 72 % and 66 % in open sun drying.
4. Which are the atmospheric relative humidity 53% is greater than GHD 48% and MGHD 43%.Temperature of MGHD room is greater than GHD room and atmospheric temperature.
5. Solar greenhouse dryers are one of the best and economical way for drying crops.
6. Which need to be preserved for long time duration.
7. Drying rate and moisture removal rate is found to be faster for MGHD and then for GHD and least for open sun drying.
8. Drying rate is directly affected by temperature and wind velocity.

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