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Study on Drying Characteristics of Guava Leaves

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Abstract

Psidium guajava L., popularly known as Guava belonging to Myrtle family is grown in tropical and subtropical climatic regions. Guava leaves has been used as medicine for various health benefits in several countries. In the present investigation, the efforts have been made to prepare the powder of Guava Leaves by applying different drying technique viz. Tray drying, Vacuum drying and Hot air oven drying. The drying was done at different temperatures 50°C, 60°C and 70°C. At a temperature, the Vacuum dryer took maximum time for complete drying of Guava leaves followed by Hot air oven and Tray dryer. Maximum moisture content was removed from fresh Guava leaves using Tray dryer whereas for the other dryers it varied with temperature. As temperature increased from 50°C to 70°C, the drying rate increased and hence the removal of moisture. The studies indicated that Tray drying was faster and effective in the removal of moisture.

Keywords: Guava leaves; Tray dryer; Vaccue oven; Hot air oven; Drying curves

Introduction

Studying about plant parts and foods are of great interest nowadays due to their high nutritional content and various health benefits [1]. Guava leaves are known as *Psidium guajava* L., are small evergreen tree belonging to the myrtle family (Myrtaceae) [2]. The Guava leaves are aromatic when crushed and has dull-green color with pronounced veins. These are native to tropical and subtropical climates, allowing production around the world [3]. The consumption of decoction, infusion, and boiled preparations is the most common way to overcome several disorders, such as rheumatism, diarrhea, diabetes mellitus, mouth ulcers, and cough in countries in South Asia and Nigeria. For skin and wound applications, poultice is externally used in Mexico, Brazil and Philippines. This plant has also been used for the controlling of life-changing conditions such as diabetes, hypertension, and obesity [4-6]. The Phenolic compounds present in Guava leaves helps in the regulation of blood-sugar level which is widely popular in Japan [7]. Guava leaf extract was found to possess properties like anticestodal, analgesic, anti-inflammatory, antimicrobial, hepatoprotective and antioxidant activities. The leaf extract also contains flavonoids like quercetin derivatives, which are hydrolyzed in the body to give the aglycone quercetin which is responsible for the spasmolytic activity [8] (Figure 1).

Drying is an important and often necessary unit operation for many processes. It can determine the quality of the final product, establish its shelf life, or expose defectiveness. It is also extremely energy intensive and time consuming, so a lot of attention should be paid to optimizing the drying step to make the total process competitive. So, an optimal temperature and the drier must be identified for the specific products to be dried [9,10]. Drying of Methi Leaves using Open sun, Tray dryer, Microwave and Vacuum oven were studied. It was found that the drying time using Tray dryer at 35°C was 11 hrs when compared to microwave drying and vacuum oven drying [11]. In the present study, the drying characteristics of Guava leaves using different drying techniques at different temperatures were done.

Materials and Methods

In accordance with the objectives of the study, experiments on drying of Guava leaves were conducted. Using the data, the drying behavior of Guava leaves from different drying techniques and different temperature and time taken were studied (Figure 2).

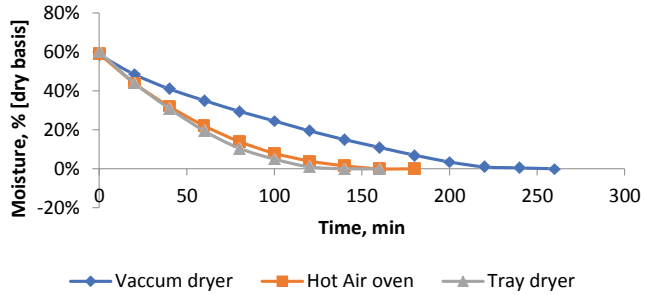

Figure 1: Drying behavior of Guava leaves at 50°C using tray, vacuum and hot air oven.

Materials

Raw material: The Guava leaves were collected from the Osmania University, Hyderabad. The freshly collected Guava leaves were sorted, washed then kept for drying processes.

Equipment: Electronic balance, Tray dryer, Hot air Oven and Vacuum dryer

Methods

Preparation of guava leaves for drying:

***Sorting*:** The stems and other unwanted parts of the collected fresh Guava leaves were removed.

***Washing*:** The leaves were washed with slightly warm water to remove the dirt particles and the excess water was drained out from

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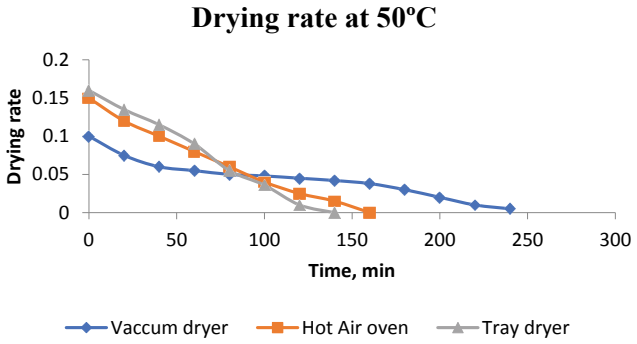

Figure 2: Drying rate of Guava leaves at 50°C using tray, vacuum and hot air oven.

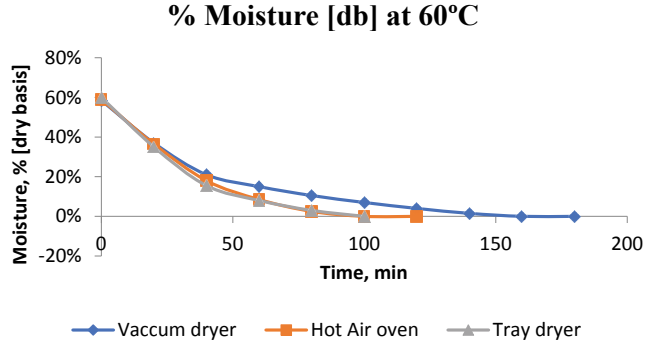

Figure 3: Drying behavior of Guava leaves at 60°c using tray, vacuum and hot air oven.

leaves. The Guava leaves were then cleaned by a dry cloth to remove the water particles.

After the complete removal of water particles, the leaves were then kept in thin layers in the trays for actual drying process.

Methods for drying: In this study Guava leaves were subjected to three different drying techniques (Tray drying, Vacuum drying and Hot air oven drying) at three different temperatures (50°C, 60°C, 70°C) to obtain the best possible quality dried product.

Initial Guava leaves samples of 20 g were weighed accurately for Oven, Tray and Vacuum drying process. The driers were pre-heated to corresponding temperature before the drying process (Figure 3).

α) ***Tray drying***: The dryer was pre-heated to required temperature and then the Guava leaves of 20 g were spread in thin layers on the trays. Once the drying process started, the weights of the sample were collected at every 20 min until a constant weight was reached. The process was done by taking three samples of 20 g each at three different temperatures 50°C, 60°C and 70°C (Figure 4).

β) ***Vacuum drying***: The vacuum chamber was pre-heated to required temperature and then Guava leaves of 20 g were placed inside the chamber. The drying process was started by creating the vacuum inside the chamber. The weights of the sample were collected at every 20 min until a constant weight was reached. The process was done by taking three samples of 20 g each at three different temperatures 50°C, 60°C and 70°C (Figure 5).

χ) ***Hot air oven drying***: The Oven was pre-heated to required temperature and then the Guava leaves of 20 g were spread in single layers on the trays. The weights of the sample were collected at every 20 min until a constant weight was reached. The process was done by taking three samples of 20 g each at three different temperatures 50°C, 60°C and 70°C (Figure 6).

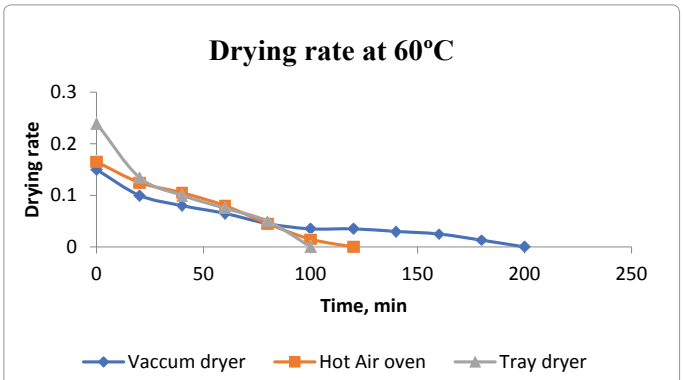

Figure 4: Drying rate of Guava leaves at 60°C using tray, vacuum and hot air oven.

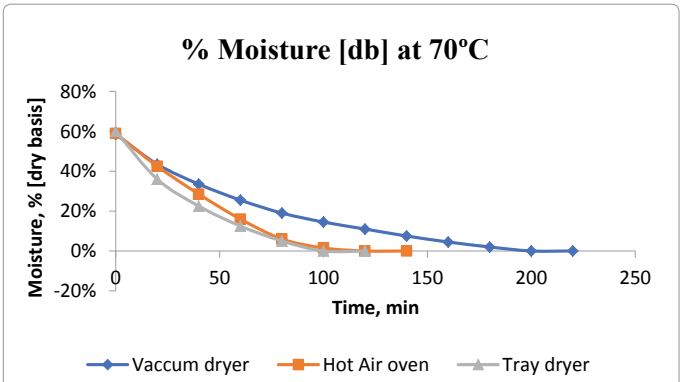

Figure 5: Drying behavior of Guava leaves at 70°c using tray, vacuum and hot air oven.

Results and Discussion

The effect of drying at various temperatures using different dryers (Tray, Vacuum and Hot air Oven) is presented below. The model of the drying graphs is referenced from Satwase AN et al., [12].

Drying at 50°C

The drying process was started by taking an initial sample weight of 20 g. At 50°C, Vacuum dryer took 4 hr 20 min to reach a constant weight of 8.3 g. Hot Air Oven took 3 hrs to reach the weight of 8.2 g and the tray dryer took only 2 hr 40 min to reach the constant weight of 8 g.

The graph is plotted for the Moisture content (% dry basis) vs time taken (min). The graph shows that the % moisture loss is approximately same for all the dryers i.e., 60%. But the time taken to reach the constant value is different for dryers. The Vacuum dryer took more time to dry the leaves when compared to Hot air oven and Tray dryer. Of all the dryers, Tray dryer took a minimum time for drying and was also effective in the removal of the moisture.

The Drying curves were plotted for the Drying rate v/s drying time (min). The curves show that the drying rate for all the dryers decreased with increase in time. All the dryers have approximately linear curves i.e., most of the curves were under falling rate period. No early transient

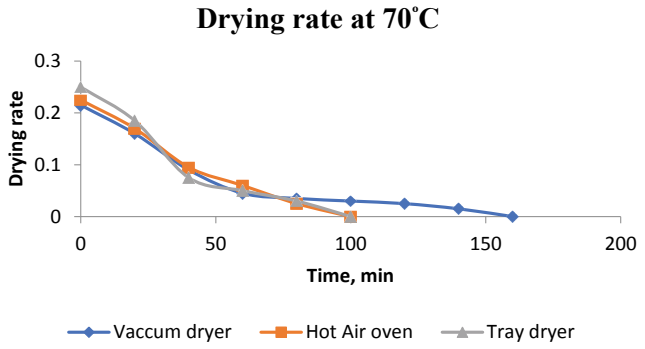

Figure 6: Drying rate of Guava leaves at 70°C using tray, vacuum and hot air oven.

stage was found (during which the product heats up). The curve for the vacuum dryer shows there were two falling rate periods.

Drying at 60°C

The drying process was started by taking an initial sample weight of 20 g. At 60°C, Vacuum dryer took 3 hr 40 min to reach a constant weight of 8.3 g. Hot air oven took 2 hr 20 min to reach the constant weight of 8.2 g and the tray dryer took only 2 hrs to reach the constant weight of 8 g.

The graph is plotted for the Moisture content (% dry basis) vs time taken (min). The graph shows that the % moisture loss is approximately same for all the dryers i.e., 60%. But the time taken to reach the constant value is different for dryers. The Vacuum dryer took more time to dry the leaves when compared to hot air oven and tray dryer. Of all the dryers, Tray dryer took a minimum time for drying. Also, it is noted that as the temperature increased from 50°C to 60°C, the moisture loss was same but the drying time reduced.

The Drying curves were plotted for the Drying rate vs drying time (min). The curves show that the drying rate for all the dryers decreased with increase in time. Tray dryer and the Vacuum dryer have two falling rate periods where as Hot air Oven has the similar curve that of 50°C. No early transient stage was found (during which the product heats up).

Drying at 70°C

The drying process is started by taking an initial sample weight of 20 g. At 70°C, Vacuum dryer took 3 hrs to reach a constant weight of 8.3 g. Hot air oven took 2 hrs to reach the constant weight of 8.2 g and the tray dryer took only 1 hr 40 min to reach the constant weight of 8 g.

The graph is plotted for the Moisture content (% dry basis) *vs* time taken (min). The graph shows that the % moisture loss is approximately same for all the dryers i.e., 60%. But the time taken to reach the constant value is different for dryers. The Vacuum dryer took more time to dry the leaves when compared to hot air oven and tray dryer. Of all the dryers, Tray dryer took a minimum time for drying. Also, it is noted that as the temperature increased from 60°C to 70°C, the moisture loss was same but the drying time reduced.

The Drying curves were plotted for the Drying rate vs drying time (min). The curves show that the drying rate for all the dryers decreased with increase in time. All the dryers have two falling rate periods. No early transient stage was found (during which the product heats up).

Conclusion

It can be concluded that the Tray drying method was the best method of dehydration of Guava leaves. At all the temperatures (50°C, 60°C and 70°C), Tray dryer took minimum time for the removal of the moisture content when compared to hot air oven and vacuum oven. As the temperature increased from 50°C to 70°C, the drying rate increased and hence the removal of moisture for each dryer. The above result was similar to the result observed by Shobha H [11].

References

1. Bernal J, Mendiola JA, Ibánez E, Cifuentes A (2011) Advanced analysis of nutraceuticals. J Pharm Biomed Anal 55: 758-774.
2. Morton JF (1987) Fruits of warm climates. Creative Resource Systems, Inc.; Winterville, NC, USA.
3. Salazar DM, Melgarejo P, Martinez R, Martínez JJ, Hernández F, et al. (2006) Phenological stages of the guava tree (*Psidium guajava* L.). Sci Hortic 108: 157-161.
4. Gutierrez RMP, Mitchell S, Solis RV (2008) *Psidium guajava*: A review of its traditional uses, phytochemistry and pharmacology. J Ethnopharmacol 117: 1-27.
5. Shruthi SD, Roshan A, Sharma S, Sunita S (2013) A review on the medicinal plant *Psidium guajava* Linn. (Myrtaceae). J Drug Deliv Ther 3: 162-168.
6. Morais-Braga MFB, Carneiro JNP, Machado AJT, dos Santos ATL, Sales DL, et al. (2016) *Psidium guajava* L. from ethnobiology to scientific evaluation: Elucidating bioactivity against pathogenic microorganisms. J Ethnopharmacol 194: 1140-1152.
7. Matsuda K, Nishimura Y, Kurata N, Iwase M, Yasuhara H (2007) Effects of continuous ingestion of herbal teas on intestinal CYP3A in the rat. J Pharmacol Sci 103: 214-221.
8. Diaz-de-Cerio E, Verardo V, Gómez-Caravaca AM, Fernández-Gutiérrez A, Segura-Carretero A (2017) Health effects of *Psidium guajava* L. Leaves: An overview of the last decade. Int J Mol Sci 18: 897.
9. Dilip MP (2014) Solids drying basics and applications. Dpharma Group Inc.
10. Muller J, Heindl A (2006) Drying of medicinal plants. University of Hohenheim, Germany.
11. Shobha H (2009) Studies on drying of Methi leaves. University of Agricultural sciences, Banglore, India.
12. Satwase AN, Pandhre GR, Sirsat PG, Wade YR (2013) Studies on drying characteristics and nutritional composition of drumstick leaves by using sun, shadow, cabinet, oven drying methods. Open Access Sci Report 2: 584.