

Study the Drying Characteristics of Pineapple Pomace under Different Drying Condition

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ABSTRACT:

About 30 to 35 percent of the total processed pineapple fruits are pineapple pomace, a byproduct of the extraction of pineapple juice. In order to make use of this waste, a research of the various quality characteristics of pineapple pomace powder, produced by two different dryers, namely tray dryer and hot air oven, was conducted. During the period of declining rates, pineapple pomace was dried. The pineapple pomace had an initial moisture level of 84.481 percent w.b. on average. As a result, both dryers' overall drying rates rose as temperature did. The current study's findings showed that it took 480 minutes in a hot air oven and 360 minutes in a tray drier to thoroughly dry the pineapple pomace, proving that tray drying entailed more moisture transfer. The co-relation between moisture loss and drying time was found to be nonlinear; with an initial increase in moisture loss was noted due to the release of free moisture in comparison to the later stages of drying.

Keywords: Pineapple pomace, drying characteristics, tray dryer, hot air oven dryer.

INTRODUCTION:

Dutch explorers made the initial discovery of the pineapple in 1493 on the Caribbean island that would later become known as Guadalupe. Fruit requires a tropical atmosphere because it can only flourish there. Pineapple fruit quickly turns brown due to cellular instability and oxygen exposure. (Kumar & R.N. Shukla 2017)

The total production of pineapple in India as per NHB 2019-2020 was 1781MT which is approximately 10 percent of the total world's production. (Heuze *et al.*, 2013)

The Bromeliaceae family member pineapple (*Ananas comosu*) is a tropical fruit has several health benefits, including its anti-inflammatory, anti-cancer, and hypoglycemic

characteristics. This fruit can be consumed raw or used to make jams, fruit salads, and concentrated juices. Thousands of tonnes of pomace (25–35 percent of the fruit weight) are produced as an agricultural by-product during processing. As pineapple pomace is perishable without treatment and includes high amounts of dietary fibre (DF), saccharides, minerals, and proteins, it not only represents a significant resource waste but also causes environmental contamination (Hu *et al.*, 2019).

About 65 percent of the pineapple used in large-scale juice processing is extracted as juice, with the other 35 percent being pineapple pomace, a byproduct. The goal of this research was to create a mash extruder for flour based on pineapple pomace. 4.8 percent ash, 1.4 percent fat, 9.2 percent crude protein, 6.0 percent crude fibre, and 66.2 percent carbohydrates were all present in pineapple pomace. (OB Oduntan 2014)

One of the most crucial techniques for long-term food preservation is drying. The elimination of moisture from the food components inhibits the action of enzymes, reduces the number of moisture-mediated deteriorative reactions, and stops the growth and reproduction of spoilage bacteria. (Watson & Harper, 1988) Long Wu *et al.*, 2007

Due to its uniform heating, quick drying, and more hygienic features, tray dryers (TD) are often used to dry fruits and vegetables. The temperature is between 65 and 80 °C. Maximum colour values are produced at these temperatures, while volatile oil loss and discoloration are kept to a minimum. Kamalakar *et al.*, (2015)

MATERIALS AND METHODS:

2.1 Materials

All the raw material was collected from the local market in Prayagraj. The present study was carried out in the research lab Department of Processing and Food Engineering Vaugh Institute of Agricultural Engineering & Technology, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj The main objective of this experiment is to study the drying behavior of Pineapple pomace under different drying techniques using tray dryer and hot air oven dryer. Matured pineapple was purchased from the local market of Prayagraj (U.P.) during the months of November to January, 2022

2.2 Drying characteristics analysis:-

2.2.1 Moisture content: Moisture content and total solids will be determined by method of AOAC (1990). The moisture content (% w.b.) of sample was calculated by using following equation:

$$\text{Moisture content (\%)} = \frac{W_1 - W_2}{W_1} \times 100 \quad (1)$$

Where,

W_1 = weight in g of the dish with the material before drying

W_2 = weight in g of the dish with material after drying

2.3 Dehydration ratio:

Drying ratio was calculated by taking the ratio of weight of samples loaded for drying in order and that the dried samples immediately after drying.

$$Dr = \frac{W_1}{W_2} \quad \dots \quad (2)$$

Where,

Dr=Drying ratio

W_1 =Initial weight of sample before drying (g)

W_2 = final weight of dried product (g)

2.4 Average drying rate:-

The average drying rates at different times were computed using following relationship suggested by Mishra (1991)

$$DR = \frac{W_r}{T \times W_d} \times 100 \quad \dots \quad (3)$$

Where

R= Drying rate (g/min)

W_r = Amount of moisture removed (g)

T = Time taken (h)

W_d = Total dry weight of sample (g)

RESULT AND DISCUSSION:

3.1 Drying Characteristics in tray drying:

Using a tray drier, pineapple pomace was dried at three different temperatures 80, 90, and 100 °C., the moisture content (db %) 80 °C ranges from 426.31 to 10.52, The average drying rate ranged from 0.014 to 0.007 and the dehydration ratio was between 1.00 and 4.76 (Table1). Similar result was found by Sharma *et al.*, (2017) for drying pineapple pomace. Moisture content (db %) varies between 426.31 and 8.42 at 90 °C. The average drying rate ranged from 1.00 to 4.85 and the dehydration ratio was between 1.00 and 4.85, (Table2). At 100 °C, the moisture content (db %) ranges from 426.31 to 6.31. The average drying rate ranged from 0.020 to 0.011 and the dehydration ratio was 1.00 to 4.95, respectively (Table 3).

Table 1:- Drying Characteristics of Pineapple Pomace in Tray Dryer at 80°C

Time (Min.)	0	60	120	180	240	300	360	420	480
Sample (gm)	5	4.15	3.56	2.93	2.35	2.25	1.95	1.71	1.05
Moisture Content (db %)	426.31	336.84	274.73	208.42	147.36	136.84	105.26	80.00	10.52
Dehydration ratio	1.00	1.20	1.40	1.70	2.12	2.22	2.56	2.92	4.76
Average Drying rate	#DIV/0	0.014	0.012	0.012	0.011	0.009	0.008	0.008	0.007

Table 2:- Drying Characteristics of Pineapple Pomace in Tray Dryer at 90°C

Time (Min.)	0	60	120	180	240	300	360	420
Sample (gm)	5	4.13	3.52	2.83	2.23	2.15	1.85	1.03
Moisture Content	426.31	334.73	270.52	197.89	134.73	126.31	94.73	8.42
Dehydration ratio	1.00	1.21	1.42	1.76	2.24	2.32	2.70	4.85
Average Drying rate	#DIV/0!	0.015	0.012	0.012	0.012	0.01	0.009	0.009

Table 3:- Drying Characteristics of Pineapple Pomace in Tray Dryer at 100oC

Time (Min.)	0	60	120	180	240	300	360
Sample (gm)	5	3.85	3.15	2.35	2.12	1.65	1.01
Moisture Content	426.31	305.26	231.57	147.36	123.15	73.68	6.31
Dehydration ratio	1.00	1.29	1.58	2.12	2.35	3.03	4.95
Average Drying rate	#DIV/0!	0.020	0.016	0.015	0.012	0.011	0.011

3.2 Drying Characteristics hot air oven drying

Using a hot air oven, pineapple pomace was dried at three different temperatures 70, 80, and 90 °C., the moisture content (db %) 70 °C ranges from 426.31 to 11.89 The average drying rate ranged from 0.02 to 0.011 and the dehydration ratio was between 1.00 and 4.46 (Table1). Similar result was found by **Sharma et al., (2017)** for drying pineapple pomace. Moisture content (db %) varies between 426.31 and 10.52 at 80 °C. The average drying rate ranged

from 0.02 to 0.014 and the dehydration ratio was between 1.00 and 4.76. (Table2). At 90 °C, the moisture content (db %) ranges from 426.31 to 7.36. The average drying rate ranged from 0.02 to 0.0022 and the dehydration ratio was 1.00 to 4.90, respectively (Table 3).

Table 1:- Drying Characteristics of Pineapple Pomace in Hot air oven at 70°C

Time (Min.)	0	60	120	180	240	300	360
Sample (gm)	5	3.58	2.98	1.99	1.535	1.24	1.12
Moisture Content	426.31	276.84	213.68	109.47	61.57	30.52	11.89
Dehydration ratio	1.00	1.39	1.67	2.51	3.25	4.03	4.46
Average Drying rate	#DIV/0!	0.02	0.017	0.017	0.015	0.013	0.011

Table 2:- Drying Characteristics of Pineapple Pomace in Hot air oven at 80°C

Time (Min.)	0	60	120	180	240	300
Sample (gm)	5	3.56	2.89	1.85	1.25	1.05
Moisture Content	426.31	274.73	204.21	94.73	31.57	10.52
Dehydration ratio	1.00	1.40	1.73	2.70	4.00	4.76
Average Drying rate	#DIV/0!	0.02	0.018	0.018	0.016	0.014

Table 3:- Drying Characteristics of Pineapple Pomace in Hot air oven at 90°C

Time (Min.)	0	60	120	180
Sample (gm)	5	3.539	2.43	1.02
Moisture Content	426.31	272.52	155.78	7.36
Dehydration ratio	1.00	1.41	2.05	4.90
Average Drying rate	#DIV/0!	0.025	0.022	0.022

CONCLUSION:

The current study's findings showed that it took 360 minutes in a hot air oven and 480 minutes in a tray drier to thoroughly dry the pineapple pomace, proving that tray drying entailed more moisture transfer. The co-relation between moisture loss and drying time was found to be nonlinear; with an initial increase in moisture loss was noted due to the release of free moisture in comparison to the later stages of drying.

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