

Performance Test of Myristica Fragrans Dryer Using A Heat System on An Electric Stove

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Abstract— Fakfak Regency is one of the regencies of West Papua province located in Indonesia. Fakfak Regency is also known as an abundant producer of myristica fragrans and seeds so that Fakfak City is often dubbed as the city of myristica fragrans. However, there is a problem that often occurs in myristica fragrans farmers, namely the occurrence of aflatoxin attacks. One way to deal with aflatoxin attacks caused by fungi and *Aspergillus flavus* is to dry myristica fragrans seeds. The goal to be achieved in this study is to determine the relationship between the drying time of myristica fragrans seeds with the amount of moisture content using a blower on an electric stove. As well as to find out the analysis of moisture content tests based on SNI standards from the results of drying myristica fragrans seeds using a blower on an electric stove. The method used in this study is the design of a myristica fragrans seed dryer using an electric stove. This design uses an electric stove as a drying heat source and uses a blower to suck the heat temperature from the electric stove. The results of this study are the relationship between drying time and moisture content in myristica fragrans drying equipment using an electric stove is $y = -3.2034x + 44.795$ with $R^2 = 0.9463$. Based on SNI standard 01-0006-1993, the appropriate moisture content value in a myristica fragrans seed dryer using an electric stove is, within 10 hours a moisture content value of 9.77% is obtained and within 13 hours a moisture content value of 6.28% is obtained.

Keywords—component; aflatoxin, myristica fragrans, Drying, moisture content.

1. Introduction

Fakfak Regency is known as an abundant producer of nutmeg fruit (*Myristica fragrans*) and seeds, so that the city of Fakfak is often dubbed as the city of nutmeg. The region's rich nutmeg cultivation has not only established its reputation as a major supplier but has also contributed significantly to the local economy. The area overgrown with nutmeg plants in Fakfak is 17,792 hectares with a production of 1,462 tons [1].

Fakfak myristica fragrans have larger fruits and leaves that tend to be larger and thicker compared to Banda myristica fragrans [2]. In addition, in Fakfak myristica fragrans, the stem has a dark color or blackish sapodilla so that there are differences in fruit and seeds [3].

Myristica fragrans, known as a spice plant with high economic value, drives the majority of the people in Fakfak to engage in nutmeg farming. Despite its economic importance, nutmeg farmers in the region frequently encounter a concerning issue, namely the occurrence of aflatoxin.

One way to deal with aflatoxin attacks caused by fungi and *Aspergillus Flavus* is to dry nutmeg seeds [4]. The overarching purpose of this study was to scientifically determine the moisture content of nutmeg pulp with a drying duration of one hour, two hours, three hours, and four hours, in order to formulate a nutraceutical drink. Drying is done with the aim of reducing the moisture content of the material to the extent that the development of microorganisms and enzyme activities that can cause decay are inhibited or stopped.

The *Myristica fragrans* farmers still use the process of drying nutmeg in the traditional way, namely by drying it in the sun. This traditional drying has many shortcomings, including requiring a long time and still relying on ever-changing weather. As a result, there is an increasing need for a more efficient and reliable drying method to enhance the quality and efficiency of nutmeg pulp processing for the development of a superior nutraceutical drink.

[5], has conducted research using a nutmeg seed grinding oven by utilizing hot air, from the results of testing the drying of nutmeg seeds using this drying oven,

the dryness rate of nutmeg seeds is around $\pm 9.15\%$ and this is in accordance with nutmeg seeds on the market, which is $8\% - 11\%$.

[6], has conducted research on drying nutmeg seeds using a hybrid dryer with solar energy sources and wood dust biomass. Total dried nutmeg seeds are 15 kg. The temperature in the drying chamber is 44°C higher than the ambient temperature of 33.5°C . To achieve the moisture content of *Myristica fragrans* seeds of 10% , it takes 32 hours continuously with a dryer and 39 hours for 4 days intermittently with the drying method.

[7] Conduct drying research on nutmeg pulp as nutmeg tea nutraceutical. The overarching purpose of this study was to scientifically determine the moisture content of nutmeg pulp with a drying duration of one hour, two hours, three hours, and four hours, in order to formulate a nutraceutical drink. From the drying results of *myristica fragrans* pulp it can be concluded that the use of nutmeg pulp as a nutraceutical is with a drying temperature of 100°C and a drying time of four hours with a moisture content of 5.2% .

[8] Conduct research on agricultural dryer technology to extend shelf life. The artificial heat sources used are; waste wood, electricity, LPG gas and geothermal. To dry pepper weighing 1500 grams takes 45 minutes. The final moisture content of pepper during 45-minute drying is 16.24% and 95-minute is 13.65% . Drying nutmeg with an initial moisture content of 38.75% and weight of each shelf I, II, III ($16.10; 17.57; 17.23$) grams takes 12 hours until the final moisture content of each shelf is ($6.54\%; 8.28\%; 9.70\%$).

II. Research Methodology

This research will be carried out from August 12, 2023 to August 31, 2023 at the Fakfak State Polytechnic, Department of Mechanical Maintenance and Repair Engineering. The process of taking data is obtained from the results of observations during the process of making tools until the results of material tests. Then the test results were carried out at the Agroindustry Department of Fakfak State Polytechnic.

A. Research Design

Before testing nutmeg dryers, the first thing to do is to design the shape of the drawing design. The research image design can be seen in figure 1. Subsequently, this carefully crafted design will guide the experimental process and ensure accurate representation in our study.

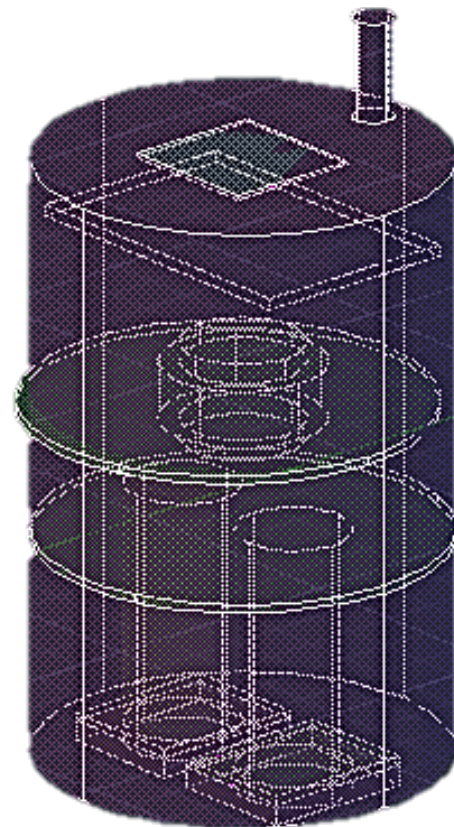


Figure 1. Design of Drying Device

B. Tools dan Material

The main components in the design of the dryer are using a 1000 W Electric Stove, Centrifugal suction blower with a size of 4 inches, drying rack and temperature control device (Digital Thermostat XH-W3001) and *myristica fragrans* 1 Kg. To illustrate the flow of this research from to the end can be seen in Figure 2.

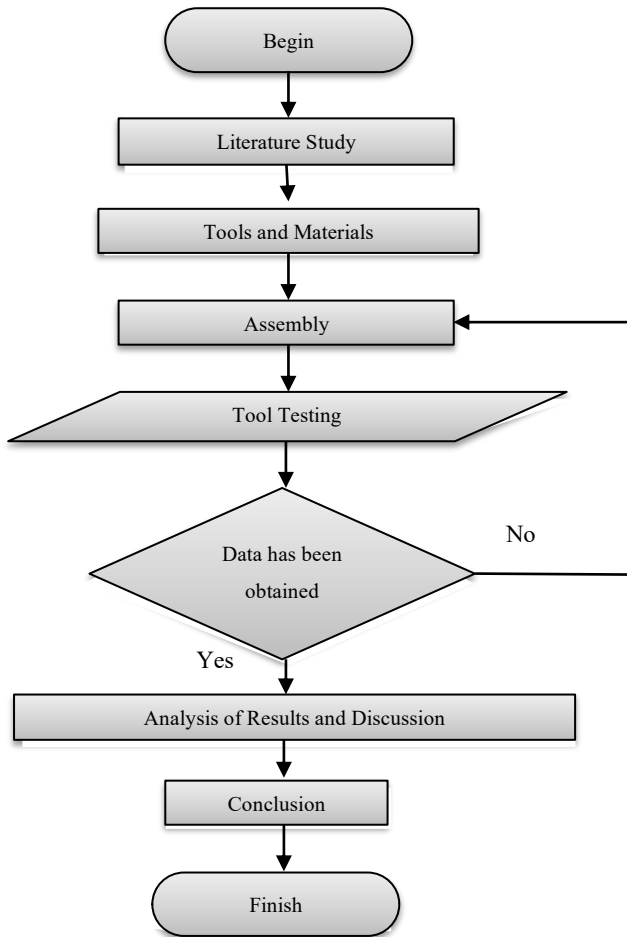


Figure 2. Research Flow Chart

III. Results and Discussion

The results of this study, depicted in Figure 3 as the myristica fragrans seed dryer, provided a visual representation of the drying process. Subsequently, based on the outcomes obtained from the tool, further testing was conducted to ascertain the specific moisture content values in myristica fragrans seeds. The maximum temperature in the nutmeg seed dryer reaches a temperature of $\pm 80^{\circ}\text{C}$.



Figure 3. The myristica fragrans seed dryer uses an electric stove

The number of nutmeg seeds used in this study as much as 1 kg can be seen in figure 3. The dried myristica fragrans seeds are then tested for moisture content at the Agroindustry Laboratory. The results of myristica fragrans seed testing can be seen in figure 4.



Figure 4. The amount of myristica fragrans used in the study



Figure 5. results of myristica fragrans seed testing

Data collection was carried out for 0-13 hours with a temperature of ± 80°C. The data collection was tested using 3 samples. Test result data the average moisture content value and Standard Deviation can be seen in table 1.

Table 1. Average value of Water Content and STDV

Time	Average Value of Water Content (%)	STDV
0 Hour	43.09	1.31
1 Hour	41.02	0.60
4 Hour	37.68	1.45
7 Hour	17.54	1.73
10 Hour	9.77	0.40
13 Hour	6.28	0.76

From the results of the graph above in Figure 5, it is obtained that the moisture content of the material from the beginning of drying to the end of drying tends to decrease by 17.90%. This decrease in water content is caused by the heat coming from the electric stove which is delivered

directly using a blower machine tool so that the room temperature reaches ± 80°C.

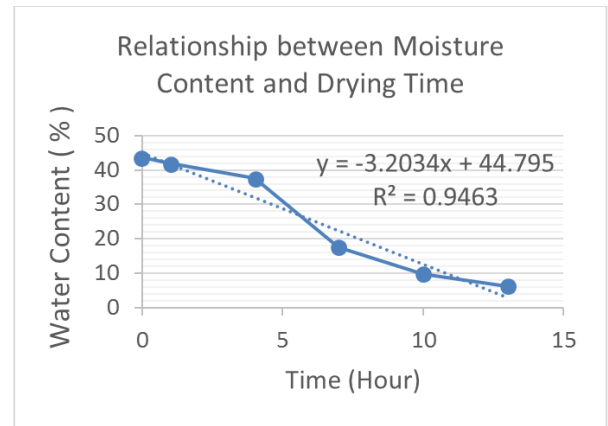


Figure 6. Relationship of Water Content and drying time.

In Table 2. It can be seen that the relationship model between drying time and water content in myristica fragrans drying equipment using an electric stove is $y = -3.2034x + 44.795$ with $R^2 = 0.9463$. From the R value (correlation coefficient) for water content and dring time [9]. In this research, it can be seen that the correlation between electric stove drying equipment and myristica fragrans seeds is very strong (94%). This shows that the longer the drying will reduce the moisture content in myristica fragrans seeds.

Table 2. Relationship between dryer time and moisture content

Drying time (Hour)	Water Content (%)	Linear Regression Equation	R ²
0	43.09	$y = -3.2034x + 44.795$	0.9463
1	41.02		
4	37.68		
7	17.54		
10	9.77		
13	6.28		

The results of SNI standard 01-0006-1993 nutmeg, where the maximum standard moisture content of myristica fragrans seeds is 10% [10]. Based on SNI standard 01-0006-1993, the appropriate moisture content value in a myristica fragrans seed dryer using an electric

stove is, within 10 hours a moisture content value of 9.77% is obtained and within 13 hours a moisture content value of 6.28% is obtained.

IV. Conclusion

1. The relationship between drying time and moisture content in myristica fragrans drying equipment using an electric stove is $y = -3.2034x + 44.795$ with $R^2 = 0.9463$.
2. Based on SNI standard 01-0006-1993, the appropriate moisture content value in a nutmeg seed dryer using an electric stove is, within 10 hours a moisture content value of 9.77% is obtained and within 13 hours a moisture content value of 6.28% is obtained.

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