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Quality Decline Detection and Economic Analysis of Cabe Jamu during Storage.

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Abstract

Cabe jamu (Piper Retrofractum Vahl.) is a plant used as an ingredient in the manufacture of Indonesian herbal medicine. Cabe jamu is a potential commodity. Madura Island, especially Sampang, Pamekasan and Sumenep districts, is one of the central producers of cabe jamu in East Java. The aspect that needs to be considered in export activities is the quality of the cabe jamu. Good quality is influenced by proper post-harvest handling such as drying and storage. The purpose of this study is to detect quality decline and analyze the economic aspects of cabe jamu. Cabe jamu storage uses 3 different temperatures, namely 30°C, 37.5°C, and 45°C with 5 observations (day 0, 10, 20, 30, and 40). The parameters in this test are water content, pH, and color. The results showed that an increase in water content caused the pH amount to increase. The color test resulted in an a value of 7, an L value of 18.5, and a b value of 24.5. The color test produces a positive value, so cabe jamu has a yellowish red and bright color. Cabe jamu usually experiences price fluctuations caused by physical damage. Generally, the price of cabe jamu is estimated at 80,000 - 100,000. Physical damage results in a price reduction of up to 50% or around 40-50 thousand/kg. A decrease in the quality and price of cabe jamu can lead to a rejection of market share and affect the economy.

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INTRODUCTION

Cabe jamu (Piper retrofractum Vahl) is a spice-producing plant that is used as a food seasoning and medicine (Kristiana et al., 2019). Cabe jamu has a promising market share, where cabe jamu is not only used as medicine and the food industry, but cabe jamu is used in the cosmetics industry (Setiawan, 2009). The producing areas of cabe jamu in Indonesia include Java, Lampung, Kalimantan, Bali, and several other producing areas. The center of cabe jamu production in East Java is on Madura Island, namely Bangkalan District (356 ha), Sampang District (1,017 ha), Pamekasan District (715 ha), and Sumenep District (1,709 ha). Sumenep

Regency is one of the places producing cabe jamu which has good soil conditions for the growth of cabe jamu (Anisah & Hayati, 2017). The current sources of competitive advantage are innovation and creativity (Safrizal, 2023). Employee performance is a stage of achievement as an employee's work achievement (Safrizal et al. 2020). Human resources are by far the most important asset for an organization (Safrizal et al. 2020). The era of globalization is always marked by rapid changes in overall economic conditions which cause a number of demands to emerge in response to the changes that occur (Safrizal et al. 2020). Focus on technologies that enable MCS to be implemented in smart cities, such as task management, data collection, incentive systems, monitoring, and cost-saving tools (Wildan et al., 2023). High Quality of Service and client-based communication with AI-enabled services is determined by Quality of Experience (QoE), (Padmapriya et al., 2023). Human Activity Recognition has been researched for the past few years (Victoria, et al., 2022). Previous research found that CSR can increase company value (tarjo et al., 2022). International trade is one of the efforts to increase economic growth and development (Priyadi et al., 2022). As a financial institution that has an intermediary function, the role of banks is very important in the economic activities of a country, where banks become institutions that distribute funds and as a place for financial transactions, this makes banks unchanged like the pulse in the human body which is very much needed to support the smooth running of a country's economy (Ryandono et al., 2022). Cabe jamu in Sumenep area has the highest price on the island of Java with the highest price per / kg of Rp. 99,000 and the lowest price of Rp. 48,000 per / kg in 2021, the price is relatively high and the price change in the market is low. In contrast to cayenne pepper which has a high market price change (Hasan and Ihsannudin, 2022).

Cabe jamu is one of the perishable agricultural products, so proper handling is required (Rachmawati and Gunawan, 2020). Improper handling can reduce quality in terms of efficacy, physical and organoleptic properties. It also affects product safety when consumed (Priyanto et al., 2021). Poor quality of cabe jamu can have effects such as rejection of market share (Dinarwi, 2006). Quality control of cabe jamu can be done by standardizing cabe jamu, where the raw material for cabe jamu must comply with the standard. The quality standards of simplisia according to SNI-01-7085-2005 can be seen in Table 1.

Table 1.Simplisia Quality Standard

No	Test Type	Unit	Requirement
1	Moisture content, max.	%	10
2	Ash content, max.	%	8
3	Acid insoluble ash content, max.	%	2.2
4	Water-soluble extract content, max.	%	14
5	Ethanol-soluble extract content, max.	%	4
6	Foreign matter, max.	%	2
7	Essential oil content, min.	%	2
8	Lead (Pb) content	Mg/kg	Negative
9	Arsenic (As) content	Mg/kg	Negative
10	Copper (Cu) content, max.	Mg/kg	30
11	Aflatoxin content, max.	Mg/kg	30
12	Organochlorine pesticide content, max.	Mg/kg	0.1
13	Yeast and mold	colony/g	1×10^4
14	Total plate count, max.	colony/g	1×10^4

15	Pathogenic microbes		Negative
16	KLT spot pattern	hRx	There are 4 spots
17	Nematode eggs	grain/g	0

The selling value of cabe jamu will increase if the quality and safety of dried cabe jamu that will be marketed are maintained, increasing the selling value of cabe jamu will make cabe jamu farmers more prosperous and community empowerment will take place well (Rohmah et al., 2020). This research aims to ensure the specifications and quality of cabe jamu are controlled and analyze the economic side of cabe jamu. This can be used as a reference for selecting the best quality cabe jamu with the appropriate price of cabe jamu.

RESEARCH METHODS

This research uses a quantitative descriptive method. Descriptive research is conducted with a literature study approach to obtain information related to problems through scientific articles, government data and so on. Quantitative descriptive research is used to describe, examine, and explain a problem and draw conclusions from the problem using numbers (Sulistyawati et al., 2022). Cabe jamu storage with temperatures including 30°C, 37.5°C, and 45°C. The tools and materials used include boxes, XH W3001 thermostats, 10 watt lamps, cables, adapters, cabe jamu kering, and gunny sacks. Cabe jamu was stored for 40 days with 5 observations, namely on the 0th, 10th, 20th, 30th, and 40th days. The equation for the rate of quality decline during storage is carried out using a linear equation (Indarto, 2012).

Table 2: Experimental design

Temp (°C) / Day	30°C (B1)	37.5°C (B2)	45°C (B3)
0 (A1)	A1B1	A1B2	A1B3
10 (A2)	A2B1	A2B2	A2B3
20 (A3)	A3B1	A3B2	A3B3
30 (A4)	A4B1	A4B2	A4B3
40 (A5)	A5B1	A5B2	A5B3

TOOLS AND MATERIALS

The tools used in this research are burlap sacks, analytical scales, color rider, white paper, sticky paper, beaker glass, aluminum foil, tissue, measuring cup, grinder, spatula, and moisture analyzer. The materials used in this study are cabe jamu and distilled water.

Moisture Content Analysis

Moisture content testing uses the help of a Moisture Analyzer tool. The tools and materials used include moisture analyzer, tissue, tweezers, cabe jamu, and containers. The steps for testing water content are opening the tool and inserting the tray into the moisture analyzer and calibrating until the weight shows
0. Weighing a sample of 2 grams and closing the moisture analyzer. Set the temperature at 105 ° C and time for 10 minutes (Hawa et al., 2020).

pH Analysis

The pH test uses tools and materials including a pH meter, beaker glass, spatula, analytical scales, grinder, measuring cup, container, cabe jamu, and distilled water. The pH test was carried out by smoothing cabe jamu using a grinder. Weighing cabe jamu as much as 25 grams and measuring distilled water as much as 35 mL. Mixing cabe jamu and distilled water and stirring using a spatula until it has a paste-like texture (Gunarti et al., 2021). Cleaning the pH meter, then

calibrating it using distilled water. Inserting the pH meter into the solution and waiting for the process to finish.

Color Analysis

Color testing uses color reader tools and materials, plain white paper, cabe jamu. Color testing steps include turning on the color reader tool, then selecting the L, A, B buttons. Calibrate the color reader using quail color paper. Testing is done 3 times until it produces accurate results (Engelen, 2018).

RESULT

Moisture Content

The following is the data from the water content test and the graph of the relationship between shelf time and water content which can be seen in Table 3 and Figure 1.

Table 3. Water Content Testing Results

Shelf Life –	Temperature		
	30°C	37.5°C	45°C
0	9.25	9.25	9.25
10	9	8.5	8
20	9.5	8	7
30	9.75	7.5	6.8
40	9.75	7	6

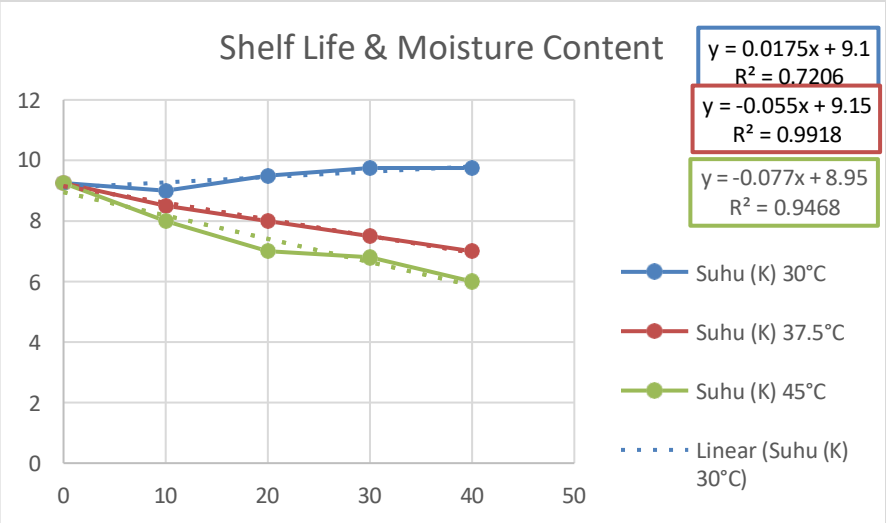

Figure 1. Relationship Graph Between Storage Time and Moisture Content

pH

The following is the pH test data and the graph of the relationship between shelf time and pH which can be seen in Table 4 and Figure 2

Table 4. pH Testing Results

Shelf Life –	Temperature		
	30°C	37.5°C	45°C
0	5.4	5.4	5.4
10	5.7	5.5	5.8
20	6.1	6.1	6.1
30	6.3	6.3	6.3
40	6.1	6.2	6.2

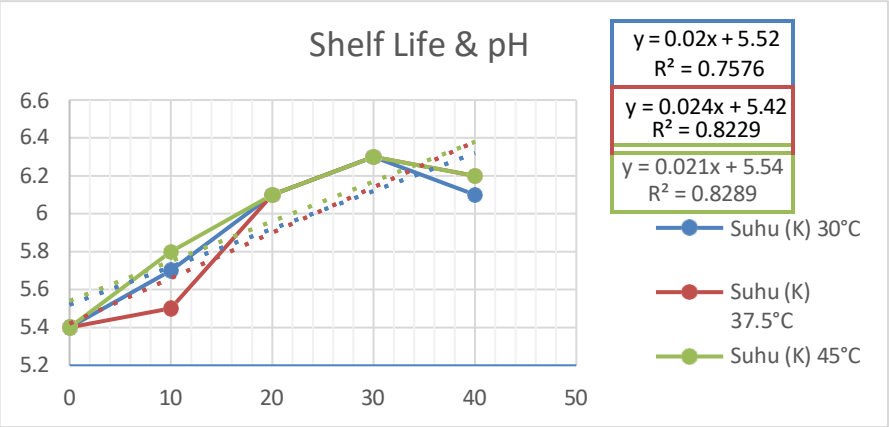

Figure 2. Relationship Graph Between Storage Time and pH

Color

The following is the data from the color test results and the graph of the

relationship between shelf time and color which can be seen in Table 5 and Figure 2.

Table 5. Color Testing Results

Shelf Life –	Temperature		
	30°C	37.5°C	45°C
0	2.8	2.8	2.8
10	5.9	8	8.9
20	8.1	11.7	9.6
30	8.8	10.9	10.7
40	10.6	11.2	11.8

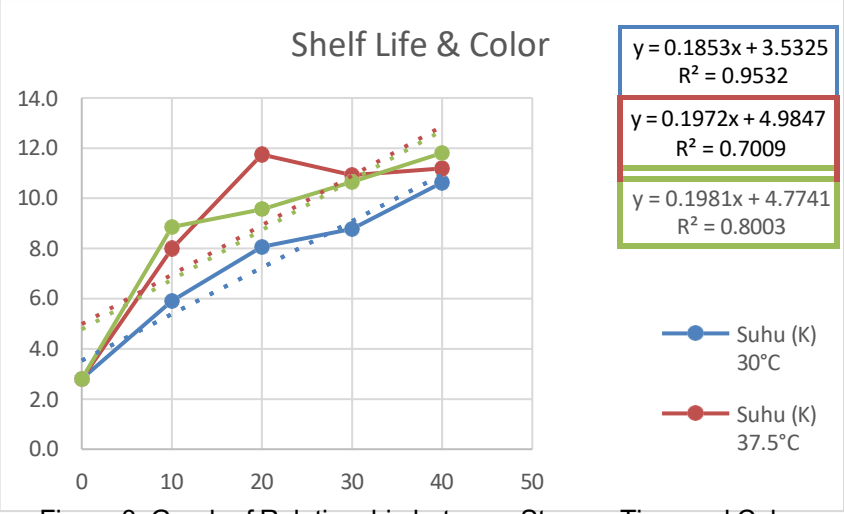

Figure 3. Graph of Relationship between Storage Time and Color

DISCUSSION

Based on table 3 and figure 1 above, it shows that the water content in cabe jamu has decreased. Cabe jamu storage at 45 ° C has the lowest amount of moisture content when compared to temperatures of 30 ° C and 37.5 ° C. This is influenced by high temperatures, the heat energy given to the stored material will be higher, so that the drying speed is higher and results in lower moisture content in a material (Amanto et al., 2015). Relatively high water content in food ingredients can cause the growth of microorganisms and damage to food ingredients, so low water content can not only maintain the content but can extend the shelf life during storage (Radiati, 2016).

Based on table 4 and figure 2 above, it shows that the amount of pH in cabe jamu during storage has increased. The amount of pH obtained ranges from 5.4 - 6.3. The storage temperature does not have a significant effect on the rise and fall of the pH amount. The increase in pH content can be caused by oxidation reactions, where oxidation reactions produce OH- values which will increase the pH amount (Ijayanti et al., 2020). Generally, food ingredients have a pH value ranging from 3-8. If the amount of pH ranges from 3-8, it will be one of the factors for the growth of microbes in food ingredients (Pujihastuti, 2007).

Based on table 5 and figure 3 above, it shows that the color of the cabe jamu is getting higher (brighter). The temperature of 30°C has a color that tends to be darker than the other temperatures. Discoloration of food is generally caused by the growth of microorganisms, which in addition to affecting color changes can also affect texture and aroma, so that food cannot be consumed (Mailoa, 2012). According to Rahasti (2008) in Ulya et al. (2020) stated that color changes are also caused by the heating and storage process or commonly referred to as the Maillard reaction.

Cabe jamu has a high economy for the community. The demand for cabe jamu is increasing day by day, where cabe jamu is not only used by the domestic community, but cabe jamu is also used by people abroad. According to Bahruddin et al. (2021) stated that the price of cabe jamu can be seen in Table 6.

Table 6: Price of Cabe Jamu

Group	Price
Grade A	80.000 – 100.000
Grade B	40.000 – 50.000

Based on the table above, it is known that cabe jamu is divided into grade A and grade B. Grade A is cabe jamu with quality that meets the standards in SNI 01-7085-2005, while grade B is cabe jamu with low quality. Grade A cabe jamu has a price ranging from 80,000 - 100,000, while grade B cabe jamu has a price ranging from 40,000 - 50,000. Based on these prices, it can be seen that the quality of cabe jamu greatly affects the selling price of cabe jamu. The price of cabe jamu will decrease by 50% if the cabe jamu has a quality that is not in accordance with the standard. A decrease in quality can result in a rejection of market share and affect the economic side. The thing that can be done to maintain the quality and selling value of cabe jamu is to do the right storage of cabe jamu.,

CONCLUSION

The conclusion of this study is that a temperature of 45°C has the greatest effect on the decline in the quality of cabe jamu. High temperatures cause evaporation to occur faster, so that the water content in cabe jamu is lower. High temperatures also cause an insignificant increase in pH value, this is influenced by oxidation reactions where hydroxide ions can increase pH. 45°C causes the color of cabe jamu to be lighter than other temperatures. The dark color is caused by the Maillard reaction due to the heating and storage process. Grade A cabe jamu has a selling price of 80,000 - 100,000, while grade B has a selling price of 40,000 - 50,000. The decline in the price of cabe jamu is estimated to reach 50%, which will affect the economy. Quality deterioration greatly affects the selling value of cabe jamu, so proper handling is needed to produce quality cabe jamu according to SNI 01-7085-2005.

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