

Physicochemical and Sensorial Analysis of Homemade Mango Jelly (*Mangifera indica* L.) in Nampula-Mozambique

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Abstract—The physicochemical and sensory analysis of mango jam (*Mangifera indica* L.) processed in a homemade manner is important due to the growing appreciation of artisanal food products for their quality and market acceptance. This study aimed to analyze the physicochemical and sensory composition of homemade jam prepared using mango pulp. The methodology involved measuring parameters such as pH, moisture, and ash content using standardized analytical methods, as well as applying sensory tests for attributes such as color, texture, aroma, and flavor, which were evaluated by assessors using an acceptance scale. The physicochemical analyses indicated that the average pH of the batches was 3.87 ± 0.08 and 3.84 ± 0.05 , with moisture values of $35.82 \pm 3.83\%$ and $32.35 \pm 1.18\%$, and ash content ranging between 0.43% and 0.64%. Statistical analysis revealed no significant differences between the batches ($P > 0.05$). In the sensory tests, 100% of the assessors considered the brown color suitable, and the texture was predominantly soft (90%). The aroma was deemed pleasant by 70% of participants, and the flavor received the highest approval in the "liked it extremely" category (50%). It is concluded that the homemade mango jam presented physicochemical and sensory characteristics within acceptable standards, highlighting the feasibility of artisanal processing as a commercial alternative. The overall sensory acceptance was satisfactory, emphasizing the market potential of this product.

Keywords—Mango jam, sensory analysis, physicochemical analysis, artisanal processing.

I. INTRODUCTION

Mango (*Mangifera indica* L.) is a fruit native to Asia, produced in tropical and subtropical regions of the world, usually consumed fresh and highly acceptable to consumers (Silva, 2018). In addition to its attractive sensory characteristics, mango has an appreciable content of vitamins, ascorbic acid, minerals, carbohydrates, fiber, carotenoids and phenolic compounds (Medeiros, 2021). Phenolic compounds have antioxidant properties and daily consumption helps prevent, among other things, degenerative processes in the body. Another important characteristic of mango is the significant amounts of bioactive compounds it contains, which contribute to a healthier diet (Lobo, 2017).

The physical-chemical analysis of processed foods, such as jelly, is essential to guarantee the quality and safety of the final product. Parameters such as pH, moisture content and ash are essential indicators that directly influence the texture, flavor and conservation of the product (Medeiros et al., 2018). Furthermore, the physical-chemical composition can vary according to the variety of mango used, the degree of ripeness of the fruit and the processing conditions, factors that

significantly impact the sensorial acceptance of the product (Lima & Costa, 2017).

Sensory analysis, in turn, plays an essential role in evaluating the quality of food products, being an important tool for understanding consumer perception regarding characteristics such as flavor, aroma, texture and appearance (Souza et al., 2020). The sensorial acceptance of a homemade mango jelly is directly linked not only to the composition of the fruit, but also to the proportion of sugars and the processing technique used, which can enhance or mask the natural characteristics of the mango (Pereira & Andrade, 2019). In this way, sensory analysis complements the physical-chemical evaluation, providing a holistic view of the product's quality.

Considering the importance of mango as a raw material and the economic potential of artisanal jelly production, it is relevant to investigate the physicochemical and sensory characteristics of homemade mango jelly. This analysis not only contributes to the development of better quality products, but also provides support for the standardization of processes and the valorization of sustainable practices in food production. Furthermore, the study can encourage the consumption of mango in different forms, promoting a more diverse and healthier diet.

The general objective of this work is to analyze the physical-chemical and sensorial composition of homemade jelly processed from mango pulp. Finally, this study seeks not only to contribute to the advancement of technical-scientific knowledge in the area of food technology, but also to encourage sustainable and innovative practices in the artisanal production of jams. The physical-chemical and sensorial analysis of homemade mango jelly will allow us to identify the main factors that influence the quality of the product.

II. METHODS AND MATERIALS

A. Study location and design

The process of obtaining the fruits and processing the mango jelly were carried out in the Samora Machel neighborhood, in the district of Mocuba, in the province of Zambézia. While the physicochemical analyzes will be carried out in the Rovuma University laboratory, on the Napipine campus.

B. Universe, sample and sampling techniques

For the research universe, 150 to 170 mangoes were collected to prepare 3 jars of 50ml jelly that are part of the sample.

In the sensory analysis, 15 residents of the city of Nampula were interviewed.

1. Data collection techniques

To collect data, the following techniques were applied: semi-structured interviews; bibliographical survey and laboratory analyses.

The laboratory analyzes were carried out in the rovuma university laboratory, which had the essential function of proving the quality of the jelly, taking into account some parameters such as humidity and ash.

2. Sample Preparation procedures

In the first step, mangoes were harvested and purchased and then selected from a universe of 150 to 170 mangoes. The researcher's sleeves and hands were sanitized. The mango skins were removed, although they could be prepared without removing them.

Ready and peeled, the mangoes were placed in a pan on the heat, with a small amount of charcoal, for 2 to 3 hours. They were then placed in a clean basin to cool and, with the help of a strainer, the mango seeds and fibers were removed, until a very thick mango juice was obtained.

Then, the mango juice was placed in a pan on the fire and left for approximately 45 minutes without stirring, and when it began to evaporate, it was started to stir lightly. The process took an average of 7 hours.

After the mango juice was at its ideal state, it was removed from the heat and left to cool for an indefinite period of time. After cooling, the jelly was removed from the pan and placed in containers (3 50ml pots) and stored naturally in the sun.

3. Procedure for determining humidity

To determine humidity, 3 g of the mango jelly sample was weighed in a porcelain or metal capsule, previously tared. The sample was heated for a period of 3 hours. It was then cooled in a desiccator to room temperature. The sample was weighed. The heating and cooling process was repeated until the weight remained constant.

Formula for determining humidity:

$$\text{Humidade} = \frac{pi - pf}{pi} \times 100\%$$

Caption: humidade = humidity; pi = starting weight; pf = final weight



Fig. 1. Weighing and drying samples in the oven at 105 °C (Author, 2024).

4. Procedure for determining gray

To determine the ash, 3g of sample was weighed in a capsule previously heated in a muffle furnace at 550 °C, and cooled in a desiccator to room temperature and then the sample was weighed and then dried on an electric plate. It was carbonized at a low temperature and incinerated in a muffle furnace at 550 °C, until the charcoal was completely removed, turning completely white or slightly grayish. It was cooled in a desiccator to room temperature and weighed again. To obtain the constant weight of the sample, the heating operations were repeated.

Formula for determining humidity:

$$\text{Cinza (\%)} = \frac{\text{peso final} - \text{peso do cadinho vazio}}{\text{peso da amostra}} \times 100\%$$

Caption: cinza = ash; peso final = final weight; peso do cadinho = crucible weight; peso da amostra = sample weight



Fig. 2. Muffle furnace, device used to incinerate samples for subsequent quantification of ash (Author, 2024).

5. pH determination

The pH was determined by the potentiometric method, with the HANNA Instruments pH meter, model HI98100. Thus, 10 g of honey was weighed in a 50 ml Becker, to which 75 ml of distilled water was added. The mixture was stirred at 40 °C for 5 minutes. After calibrating the pH meter, the electrode was immersed in the diluted honey sample, waiting until the reading stabilized, at which point the pH value was directly recorded.



Fig. 3. Direct potentiometric pH reading in samples (Author, 2024)

6. Sensory analysis

In the sensory analysis of homemade mango jelly, a sensory panel was formed, consisting of 30 untrained and volunteer tasters. Among them: students of both sexes, aged between 18 and 45, residents of the city of Nampula.

Sensory analysis was carried out using the acceptability test (acceptance) and the affective test (preference), evaluating attributes such as color and texture. These attributes were evaluated using a 10-point hedonic scale (attachment), which ranged from extremely unpleasant (point 1) to extremely pleasant (point 9), with an intermediate value of 5 (neither pleasant nor unpleasant) using the analytical standards of the IAL (2008).

The tasters each received a sample, randomly on disposable white-coated paper plates, previously coded with three-digit numbers and water was made available for neutralizing other flavors and for rinsing.

III. DATA PROCESSING AND ANALYSIS

The data were analyzed using the STATGRAPHIC statistical package. To evaluate the results, the nature of the variables studied was considered. Quantitative variables were worked through measures of central tendency and dispersion. For categorical outcomes, absolute frequency values were calculated.

IV. PRESENTATION OF RESULTS AND DISCUSSION

TABLE 1. Results (mean $\pm$ standard deviation) of physical-chemical analyzes of Mango jelly

Parameters	Batch 1			Batch 2			ANOVA	
	Média $\pm$ DP	Min	Máx	Média $\pm$ DP	Min	Máx	F-Ratio	P-Value
pH	3.87 $\pm$ 0,08	3,81	3,97	3.84 $\pm$ 0,005	3,84	3,85	0,29	0,6167
Humidity (%)	35,82 $\pm$ 3.83	31,41	38,29	32.35 $\pm$ 1.17	31,2	33,54	2,25	0,2081
Gray	0,54 $\pm$ 0,10	0,43	0,63	0,50 $\pm$ 0,11	0,41	0,64	0,19	0,6843

Source: Author, 2024

A. Humidity

For humidity, Lot 1 presented an average of 35.82%, with values ranging from 31.41% to 38.29%, indicating greater dispersion in the data and, therefore, greater variation between samples. On the other hand, Lot 2 presented a lower average of 32.35, with a narrower range of variation, between 31.2% and 33.54%. This difference suggests that Lot 2 may have undergone more rigorous control during processing, resulting in more homogeneous moisture. Despite the difference between the means, the ANOVA test revealed a p-value of 0.2081, indicating that the difference between the two batches is not statistically significant. Adequate humidity control is important not only for sensorial quality, but also to avoid problems related to microbial growth and product durability.

Santos *et al.* (2012) developed research on unconventional jelly with a fruit also belonging to the Myrtaceae family, cagaita (*Eugenia dysenterica*). In their analysis, they obtained humidity of 35.21%. This result is similar to the findings in this research.

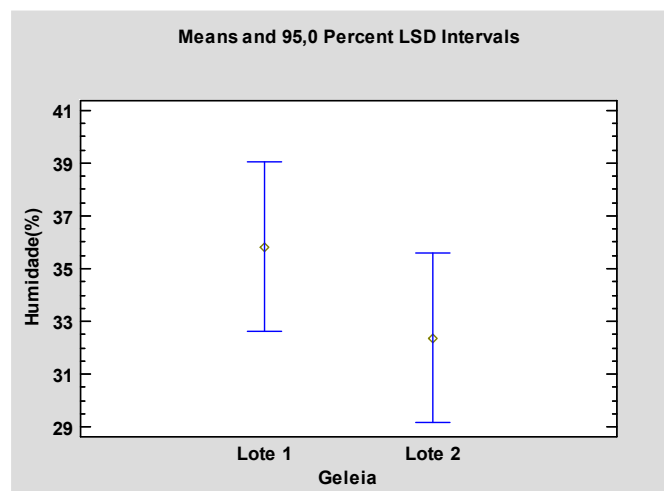


Fig. 4. Humidity values (Author, 2024).

Caption: humidade = humidity; lote = batch; geleia = jelly

B. Ash

The ash content reflects the mineral content of the mango jelly, an important parameter for evaluating the nutritional quality of the product. In relation to ash, Lot 1 presented an average of 0.54% of ash, with minimum and maximum values varying between 0.43% and 0.63%. Lot 2, on the other hand, presented a slightly lower average of 0.50%. This slight difference between batches indicates that the mineral contents are consistent, with small variations that can be attributed to factors such as the uniformity of the mango pulp used or differences in evaporation during the manufacturing process. The ANOVA test revealed a p-value of 0.6843, confirming that the differences observed between batches are not statistically significant. This demonstrates that, regardless of the batch, the mineral content is within an acceptable range, ensuring that the final jelly composition remains nutritionally balanced and consistent.

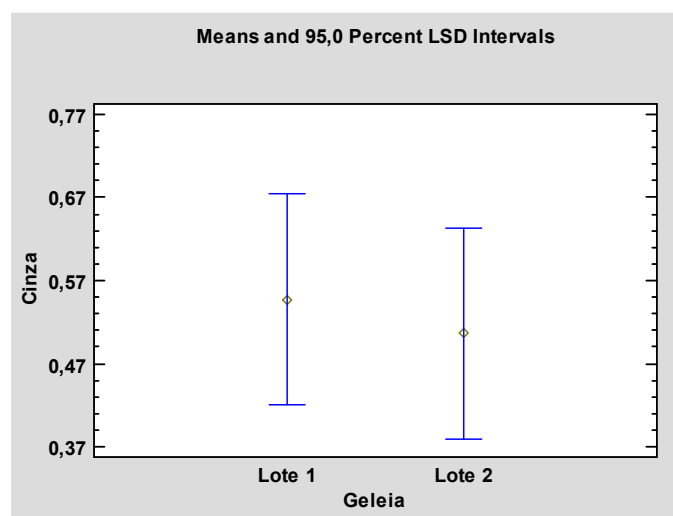


Fig. 5. Ash content in samples (Author, 2024).

Caption: cinza = ash; lote = batch; geleia = jelly

C. Hydrogen potential (pH)

Hydrogen potential (pH) is an essential parameter for the quality and conservation of jams, directly influencing the flavor, texture and microbiological stability of the product. Lot

1 had an average pH of 3.87, with minimum and maximum values varying between 3.81 and 3.97, showing a slight dispersion in the data. Lot 2 presented an average of 3.84, with a more restricted range of variation, between 3.84 and 3.85. The difference between the two batches is minimal, with very close average values, indicating that both batches have adequate acidity levels for the mango jelly formulation. The result of the ANOVA test, with a p-value of 0.6167, confirms that the observed difference is not statistically significant. This suggests that the processing of the two batches was consistent in controlling pH, an important factor for the stability of the final product and for ensuring an acidity that favors the typical flavor of tropical fruits such as mango.

For Conceição *et al.*, (2012), a pH of 3.54 was obtained when making an acerola jelly with guava. Resosemito *et al.*, (2012), when preparing a passion fruit jelly with chili pepper, obtained a pH value of 4.0. Zambiasi, Chim, Bruscatto (2006) evaluated the composition of light strawberry jellies, which presented pH values of 3.51; Silva (2013), in research on the rheological behavior and physical-chemical characterization of umbu jelly, found pH 2.95, a result that differs from the findings in this work. Neto *et al.*, (2012), during the physical-chemical characterization of purple cherry jelly, obtained an average pH of 3.22.

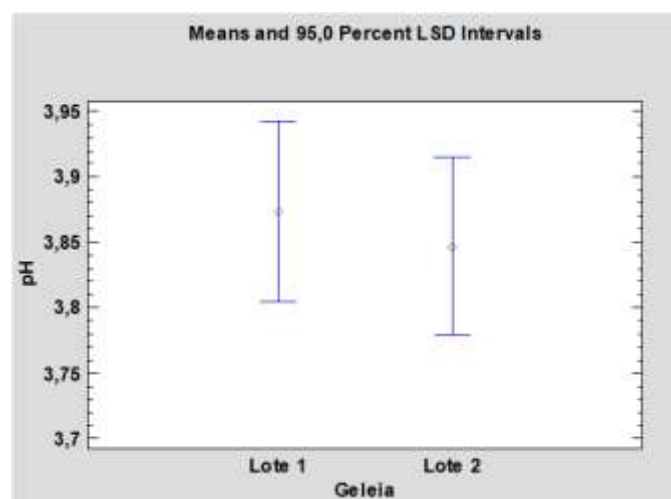


Fig. 6. pH variation in the samples (Author, 2024).

Caption: Lote = batch; geleia = jelly

D. Sensory analysis

The sensory evaluation was carried out by 20 untrained evaluators of both sexes, aged between 16 and 40 years. The mango jelly samples were served in disposable cups, coded with random three-digit numbers, presented in a balanced way. These were served with accompaniment of crackers and a 100 mL glass of water, to clean the palate between sample evaluations.

The jelly samples were evaluated for the acceptance test of attributes such as flavor, smell, color and texture. For this, the judges used a form that presents a structured hedonic scale of nine points, ranging from "disliked" to "extremely liked".

Based on Table 2, the sensory analysis of homemade mango jelly revealed very positive results, with emphasis on the unanimity regarding the color of the product. All evaluators (100%) classified the color as brown, which

suggests an attractive appearance and in line with the expectations of a handcrafted product. The texture was also widely approved, with 90% of participants indicating that the jelly was soft, a desirable characteristic in products of this type. Only 10% mentioned that the texture was fibrous, and no evaluator considered the texture to be hard, demonstrating that the processing reached a satisfactory consistency.

TABLE 2. Sensory analysis results of mango jelly

N°	Attributes	Categories	Average	Percentage (%)
01	Color	Brunette	1	100
02	Texture	Soft	0,9	90
		Fibrous	0,1	10
		Hard	0	0
03	Smell	Pleasant	0,7	70
		Unpleasant	0	0
		Reasonable	0,3	30
04	Flavor	Extremely tasty	0,5	50
		Very tasty	0,25	25
		Moderately tasty	0,25	25
		Disgusted	0	0

Source: Author, 2024

The aroma of the jelly was another highlight, with 70% of evaluators describing the smell as pleasant, reinforcing the quality of the product. Despite this, 30% classified the smell

as fair, which indicates that there may still be room to improve the intensity or aromatic balance. No participant found the smell unpleasant, which reinforces the general sensory acceptance. Regarding flavor, approval was also high. Half of the evaluators (50%) extremely liked the flavor, while 25% liked it a lot and another 25% liked it moderately. There were no reports of displeasure, which shows that the jelly formulation pleased the taste of all participants.

These results show that homemade mango jelly has highly attractive sensory characteristics, especially in color, texture and flavor. Although the smell presented slightly more divided opinions, the majority considered the sensorial experience to be positive. With this data, it is possible to conclude that the product has great potential for market acceptance, especially with small adjustments in specific points to serve an even broader audience.

According to Dutcosky (2011), for a product to have good acceptability, the Acceptance Index must be equal to or greater than 70%. According to Amaral et al., (2012), they found 98% acceptance for a passion fruit pulp and peel jelly, the authors consider the grade appropriate for this type of product.

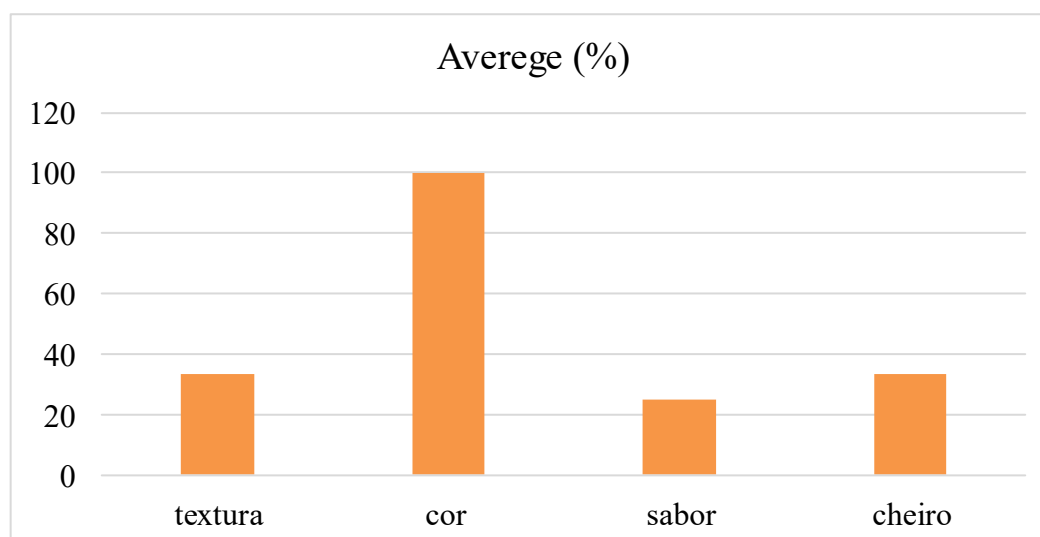


Fig. 7. General average in percentage of each attribute evaluated (Author, 2025).

Caption: Media = average; textura = texture; cor = color; cheiro = smell

V. CONCLUSION

The production of homemade jams has gained prominence in the food market due to the growing appreciation of artisanal, natural products with high sensory quality. Mango jelly, in particular, presents itself as a promising alternative, considering the nutritional properties and attractive flavor of the fruit, widely consumed in several tropical regions. Homemade jam processing, in addition to adding value to the raw material, contributes to the diversification of food products and encourages local entrepreneurship. This study evaluated the physical-chemical and sensorial qualities of artisanal mango jelly, highlighting its potential for acceptance and commercialization. Based on the results obtained, it was found that the homemade jelly presented adequate and

consistent physical-chemical characteristics between the batches analyzed. The average pH of 3.87 and 3.84, respectively, in batches 1 and 2, demonstrates an acidity compatible with the conservation of the product, while the humidity levels, between 31.41% and 38.29%, and the ash content, varying between 0.43% and 0.64%, confirm good quality and control in processing. Statistical analysis revealed that there were no significant differences between batches, reinforcing the uniformity and stability of the final product, crucial factors for success in the food market.

In the sensorial aspect, the results highlighted the high acceptance of the product among evaluators. The brown color was considered suitable by 100% of tasters, and the soft texture received 90% approval, reflecting appropriate

preparation techniques. The smell was rated as pleasant by 70% of participants, and the flavor stood out with 50% of evaluators indicating extreme satisfaction, while 25% liked it a lot and 25% liked it moderately. These data demonstrate that the jelly meets consumer expectations, especially with regard to essential attributes such as appearance, aroma and flavor. Thus, it is concluded that homemade processed mango jelly has qualities that make it competitive and attractive in the market. The physical-chemical and sensory analyzes carried out demonstrate the viability of artisanal processing, ensuring the production of a product of high quality and acceptance. These results reinforce the commercial potential of jelly, especially in niche markets that value natural and artisanal products. The uniformity between batches and sensory approval highlight home processing as a viable alternative for entrepreneurship in the food sector.

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