

Research Article

SENSORY ANALYSIS OF COMMERCIAL GHEE: A Comparative Study between a Homemade Ghee and Butter-Of-The-Land

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Received: 09-09-2017

Accepted: 10-29-2017

Published: 10-30-2017

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Abstract

Objective: The purpose of this paper is to analyze and compare commercial ghee with homemade ghee and butter-of-the-land.

Methods: The samples were tested in the Laboratory of Dietary Technique and Food Analysis of Universidade Potiguar - UNP. These samples were submitted to sensory analysis by untrained, randomly picked tasters ranging in age between 18 and 60 years. The evaluation was performed through the 9-point hedonic scale for the attributes of flavor, aroma, texture, color and global acceptance. The purchase intent was spread through a 5-point scale.

Results: The *butter-of-the-land* obtained the highest AI (90%), followed by the commercial ghee (88%) and homemade ghee (86%), which suggests a good acceptance by the tasters. Regarding the purchase intent, the *butter-of-the-land* and the commercial ghee were scaled better (79%) when compared with homemade ghee (74%).

Conclusion: Therefore, the purchase intent research showed that the three butters would be accepted in the market, corroborating (with) the results of the acceptability tests.

Keywords: Sensory Analysis; Ghee Butter; Butter of the Land; Purchase Acceptance

Abbreviations:

AI: Acceptability index (AI);

CLA: Conjugated linoleic acid;

FPICF: Prior and Informed Consent Form;

SBRT: Service for Technical Answers

Introduction

Ghee is a clarified butter of Indian origin and has been used for thousands of years in Ayurveda, a classical and holistic medicine, which has as meaning the knowledge or science (veda) of classic longevity (ayus). It is considered one of the most ancient and thorough disease healing and prevention methods in India [1,2]. According to literature on natural Indian products [3], since ancient times, Indian ghee is regarded as a sacred

food and is used in cuisine as the preferential cooking oil. Its fat is used for most food preparations and for frying.

The consumption of foods such as butter and margarine is appreciated by the majority of people. However, the consumption is scarcer than it could be due to the health damage risk resulting from its high fat content [4]. Margarine and conventional butter have saturated fat, but the former has no cholesterol and is of vegetable origin whereas the latter has cholesterol

and is of animal origin. As an alternative to these comes ghee, whose processing modifies conventional butter form [5].

According to studies by Talaska et al. [6] dietary fat, more specifically ghee, compared to soybean oil presented a protective effect against breast cancer carcinogen inductors. Matam, Sambaiah & Lokesh [7] observed a hypocholesterolemic effect in a test performed with humans for a short period of time, but further studies are still necessary. Fuke & Nornberg [8], and Shokryzadan [9] have shown that the high CLA (conjugated linoleic acid) intake through ghee resulted in lower plasma levels of cholesterol and triglycerides, and that CLA was also recently seen as anticancer. Relating the benefits of ghee to the concern for a better quality of life, Brazilians are increasingly knowing and enjoying the different advantages of food, including ghee, which is free from the impurities of regular butter. Moreover, industries are expanding investment in production and marketing, and, therefore, the technological processes used offer more benefits to food [10].

Ghee is produced mainly in India through the clarification of buffalo milk, subjected to high temperatures (373,15K to 393,15K) and this heating process grants butter a characteristic aroma, one of its main features to the consumer [11]. In Brazil, ghee is produced with cow milk, and its production, according to the Brazilian Service for Technical Answers (SBRT) [12], is made with 0.5 to 2.0 kg unsalted butter in a container over very low fire or in a water bath. The foam or "sludge" formed at the top is removed and the product is sieved to remove the impurities. This procedure is performed until all the waste is removed and a golden liquid is obtained, which yields ghee.

The consumption of ghee has positive effects for the population as it contains antioxidant properties, preventing premature aging and protecting cells from free radicals, due to its considerable levels of vitamin A and E [13]. Furthermore, it presents an anti-inflammatory effect and because it is free from sodium, it can be used by people who need to restrict this nutrient in the diet. It also has a low moisture content, which increases the shelf life of the butter for 6–8 months, even at room temperature. A shelf life of more than 2 years has also been reported [14,15]. The main criterion for the acceptance of ghee is its characteristic flavor, which comes from a complex mixture of several compounds produced during the various stages of processing [16].

Therefore, the population needs to experience and expand their knowledge on the benefits of ghee for health, as well as its organoleptic characteristics. The present research set the objective of investigating a sensorial analysis of commercial ghee in relation to homemade ghee and butter-of-the-land.

Material and Methods

Research Design

The study herein is a descriptive one, and a field research was conducted with emphasis on a sensorial analysis approach of commercial ghee. For the development of the analysis there was homemade production of ghee, acquisition of the raw material in the local market (commercial ghee and butter-of-the-land), as well as the acquisition of crackers for monitoring the acceptability test and for palate cleansing in between the samples. The acquisitions were made in Natal/RN and were self-funded and/or provided by the Potiguar University. The acceptability analysis was performed at the Technical and Dietetic Laboratory of the Potiguar University – UnP. According to Faria & Yotsuyanagi [17], for the application of the consumer test in a laboratory, a minimum of 100 participants is required. Therefore, the research sample comprised 105 participants, from which 71 were female, and 34 male.

The project was sent to the Ethics and Research Committee of the Potiguar University using the Brazilian Platform, CAAE 57912616600005296. Once accepted, the research in question was applied.

The participants were undergraduate students, as well as teachers and staff of the institution who demonstrated interest in taking part. They were between 18 and 60 years old, untrained, and did not present any allergy and/or intolerance to the food or any of its components. Another requirement was the absence of any respiratory problems (cold and/or rhinitis), which could hinder the sensorial analysis and interfere in the perception of the organoleptic characteristics. The testers who expressed aversion or intolerance to the lactose contained in the butter's raw material, and/or allergy to cow milk protein, in addition to respiratory problems were excluded, so as not to influence the sensory responses to the products.

Risk Factors and Benefits Involved in the Research

The risk involved in participating in the research, in case it was unknown to the tester was: allergy and/or intolerance to any of the food components, especially lactose and cow milk protein. This risk was minimized by filling in a form containing the necessary inquiry for a possible exclusion of the tester. If the tester was unaware of any allergies, they would be referred to the university's nursing department and in case of intolerance reactions, the lactase enzyme was offered in the technical and dietetic laboratory so as to mitigate any existing symptoms.

Among the benefits of the research are: to identify the different flavors, textures, aromas and colors of the three different foods, to assess the purchase benefits of the tasted product and familiarize the tester with another type of (non-regional) butter with healthier features available in the Brazilian market.

Therefore, this knowledge was expanded both to defer palatability and to spread knowledge on the product.

Conducting Sensory Tests

Sensory tests were performed on 1 day, during the morning and afternoon shifts, long after the main meals, in the Laboratory of Dietary Technique and Food Analysis at the Potiguar University - Natal/RN, in individual, noise-and-odor-free booths. The samples were served on coded trays with three digits, presented in a random and monadic way, together with a glass of water and crackers. The tasters were instructed to ingest water after each tasting.

Application of the Acceptability Test

The method used to identify the acceptability index was the hedonic scale with a 9-point nominal structure in which the testers expressed their acceptance of the products according to each attribute of the preparation (flavor, color, texture, aroma and overall acceptance). For each impression of the tasters, a score from 0 to 9 was assigned, in ascending order of acceptance. It was then recorded on the acceptance form and described according to the following variables: greatly disliked = 1, disliked = 2, liked slightly = 3, liked it = 4, liked it a lot = 5, liked it regularly = 6, liked it slightly = 7, liked it very much = 8, and loved it = 9 [17].

For the calculation of the product acceptability index (AI), the following expression was used: $AI (\%) = A \times 100 / B$; where A = average grade obtained for the product and B = maximum grade given to the product [18]. Together with the sensory test, the purchase intent test of the developed product was performed, through a five-point scale with the following options: I would certainly not buy, I would probably buy, I am in doubt if I would buy, I would probably buy, and I would certainly buy [19]. For this evaluation, a fact sheet was made available on the consumer's attitude towards the purchase of the product, using the foregoing scale and the identified samples, with sequential Arabic numbers [20].

Suspension Criteria

The criteria for suspension of the research are related to the aversion of the individuals with respect to the experiment of the analysis developed with ghee, or to the inexistence of participants. From the acceptance of the invitation, the taster reported in a file, the existence of allergy to milk protein or the presence of lactose intolerance and diseases that could affect the respiratory system, for the investigation of the sensory analysis. This procedure was used to minimize interference in the results of the research.

Research Procedures

The Free, Prior and Informed Consent Form (FPICF) was read and signed in two counterparts of equal content and form. Subsequently, the participant underwent the following procedures: sit in an individual booth and taste 3 mL of commercial ghee, homemade ghee and butter-of-the-land, respectively, added to a biscuit bread, cut into 3x3cm squares, intercalating the water and the cracker between one sample and another.

Statistical Analysis

The sensorial parameters were analyzed by means of descriptive statistical analysis of the data. The average of the analysis results were generated through Microsoft Office Excel 2007.

Results and Discussion

To perform the sensory analysis test, the nine-point scale was used. This presented a variance from great disliked to really loved, for the application of the acceptance test. These tests are relevant and used when it is necessary to know the consumers opinion and their 'affective status' in regard to the products presented [21].

Aroma Acceptability Index

For a product to be accepted by the tasters it should reach a percentage higher than or equal to 70% [16]. In this study, the acceptability index corresponds to the average between the points "6, 7, 8 and 9" of the hedonic scale, in which the satisfaction can be observed. The 'aroma' attribute of homemade ghee reached 87%, being higher than that of commercial ghee (85%) and butter-of-the-land (79%). This lower acceptance of the butter-of-the-land as to the aroma may possibly be related to the result of the commercial stability period of the products, as reported by Vaz [22]. This could be the result of a more rancid aroma of the butter-of-the-land, which triggered a reduction in the characteristic aroma of butter as perceived by the tasters. Furthermore, the tasters more critically assessed the more oxidized samples by awarding them with lower grades. Butter-of-the-land is usually marketed at room temperature and in packs which allow the passage of light. These factors contribute as potent oxidative accelerators which lead to the appearance of rancid flavors and aromas, in addition to reducing the nutritional value and the shelf life of the product [23].

Sensory Acceptance

Analyzing Figure 1 C, it can be seen that the butter-of-the-land presented the greatest sensory acceptance at 9 points in the scale (loved it), followed by homemade ghee (Figure 1 B) and commercial ghee (Figure 1 A). In the study by Silva et al. [24] the value of 9 points ("I loved it"), presented its sensorial acceptance as being directly proportional to the amount of NaCl

in the butter. In this study, the commercial and homemade ghee presented high sensorial acceptance, when compared to the foregoing research. The extra, unsalted butter analyzed depicted a relatively high acceptance result, corroborating with the present research, since both butters are salt-free in their composition.

not to have added salt - had a greater preference, whereas in the present study, the butter-of-the-land had added salt and yielded better acceptability.

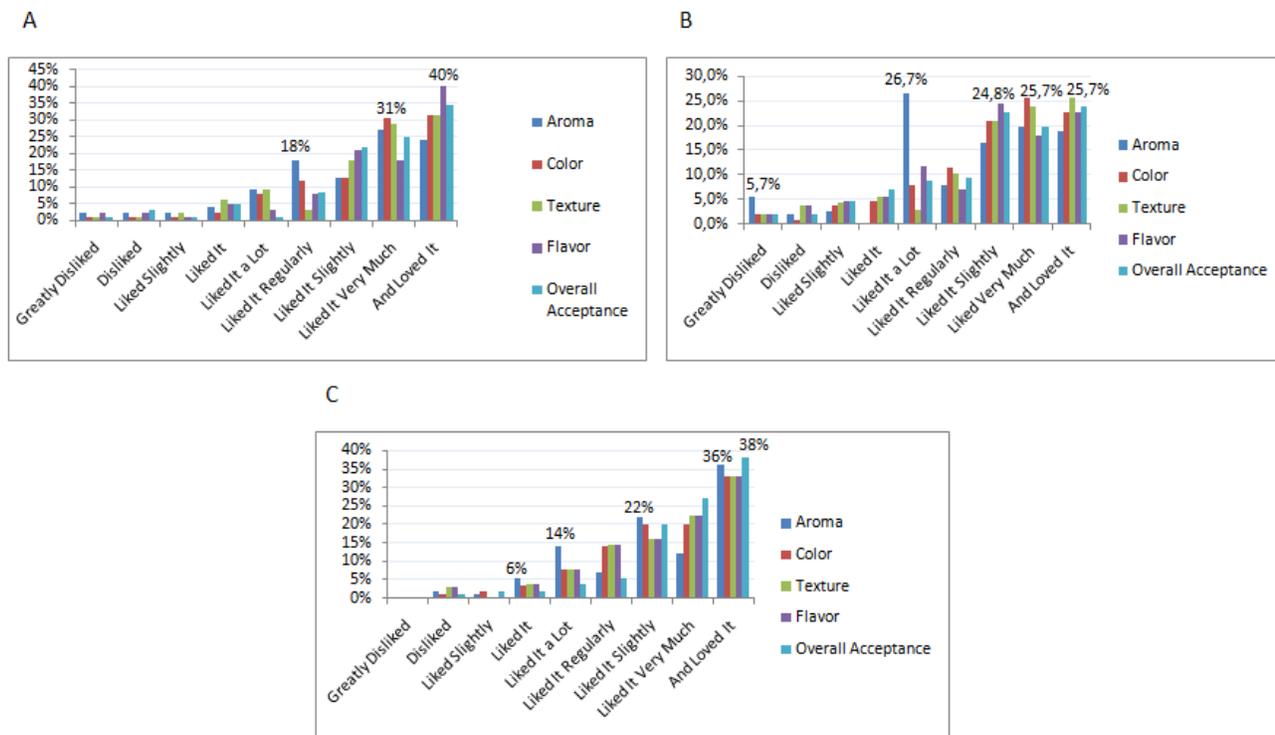


Figure 1. Sensory analysis of homemade ghee butter, commercial ghee butter and butter of the land conducted through the school of nine points.

Flavor Acceptability Index

Homemade ghee presented 87% for the 'flavor' attribute, lower than that of commercial ghee (89%) and butter-of-the-land (90%). The 'overall acceptance' attribute was higher for butter-of-the-land (90%), than commercial ghee (88%) and finally homemade ghee (86%). The butter-of-the-land analyzed presents added sodium in its composition, possibly favoring a greater acceptability for the 'flavor', and 'global acceptance' attributes. When Hellemann, Barylko-Pikielna & Matuszewska [25] compared the sensory acceptability of wheat buns and low-salt sandwiches with butter at different concentrations of NaCl, they found that the lower the sodium concentration, the lower the acceptability. Nassu [26] demonstrated in his investigation that sodium-reduced content butter-of-the-land was not appreciated by the testers, with an acceptability of less than 47% for all the attributes investigated. In the study by Vaz [22], a characteristic taste of oxidized fat (rancid) was perceived, however, in the present study there was no suggestion whatsoever that rancidity was at an unpleasant level to the tester. Brandão et al. [27] reported in their study, with respect to the taste that the standard butter - reported by the testers

Texture Acceptability Index

The AI for the 'texture' regarding the three butters was the same, at 87%. This good acceptability is possibly due to the absence of granules and lower viscosity. Ribeiro & Seravalli [28] predicted in their study that as the viscosity increases, the more the oxidation is enhanced. Good appearance is due to homogeneity, uniformity, presence of a single continuous phase, and absence of granules, as reported by Vaz [22].

Color Acceptability Index

Considering the color shade, which ranged from light yellow to dark yellow, commercial ghee had higher AI (88%), than butter-of-the-land (87%) and homemade ghee (86%). In the study by Vaz [22] it was observed that more oxidized samples were characterized by a smoothing in the color hue. Possibly in this present research, the darker the color of the butter, the less oxidation and the better the AI found.

Global Acceptance Index

For the 'global acceptance' attribute, all the tested samples presented good acceptance by the tasters. The average acceptance of commercial and homemade ghee, using the attributes of the hedonic scale from "I liked it slightly" to "I loved it", showed results equivalent to 87%. However, the butter-of-the-land presented a higher average with 100%. The features most quoted by the tasters in relation to what they liked most regarding the attributes of the butter with the highest average were: texture, flavor and color of the evaluated product. Considering the scale from 6 to 9 points, the homemade ghee presented greater sensorial acceptance for the aroma and texture attributes; the commercial ghee for the flavor and color attributes; and the butter-of-the-land, for the aroma and global acceptance attributes.

Purchase Intent

For the evaluation of the purchase intent (Figure 02), a scale with a five-point structure was used (from 1 - *Would certainly not buy* to 5 - *would certainly buy*), and higher scores were obtained in points 4 and 5 corresponding to "probably would buy" and "would certainly buy." Thereby, the study demonstrates that the products analyzed have good market acceptability. It also provides a first contact with the three different options to the testers, further to contributing to spreading knowledge on the existence of ghee, especially for individuals with lactose sensitivity and NaCl restriction.

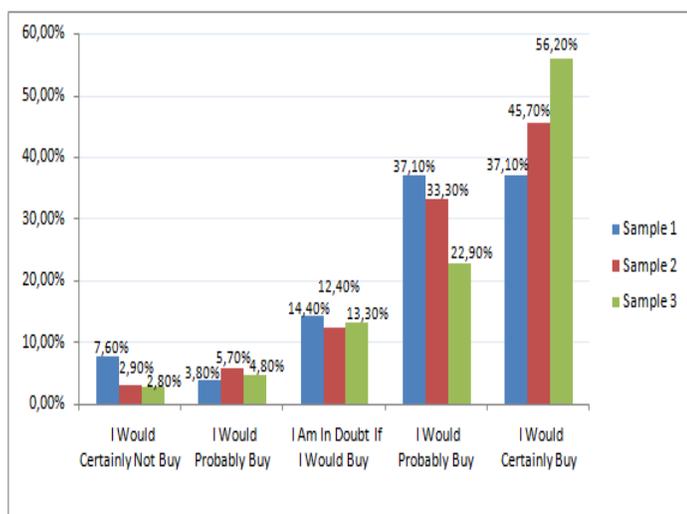


Figure 2. Purchase intent for the samples analyzed through the 5-point scale.

Conclusions

The results obtained with the development of this research showed that it was possible to compare homemade ghee, commercial ghee, and butter-of-the-land using sensorial assessment, as well as to identify good acceptability of all attributes

analyzed (color, flavor, texture, aroma and overall acceptance) by comparing the features of the butters. The intention of purchase research showed that the three butters could be accepted in the market, corroborating the results of the acceptability tests.

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