Desafios da Ciência e Tecnologia de Alimentos 2

Damaris Beraldi Godoy Leite
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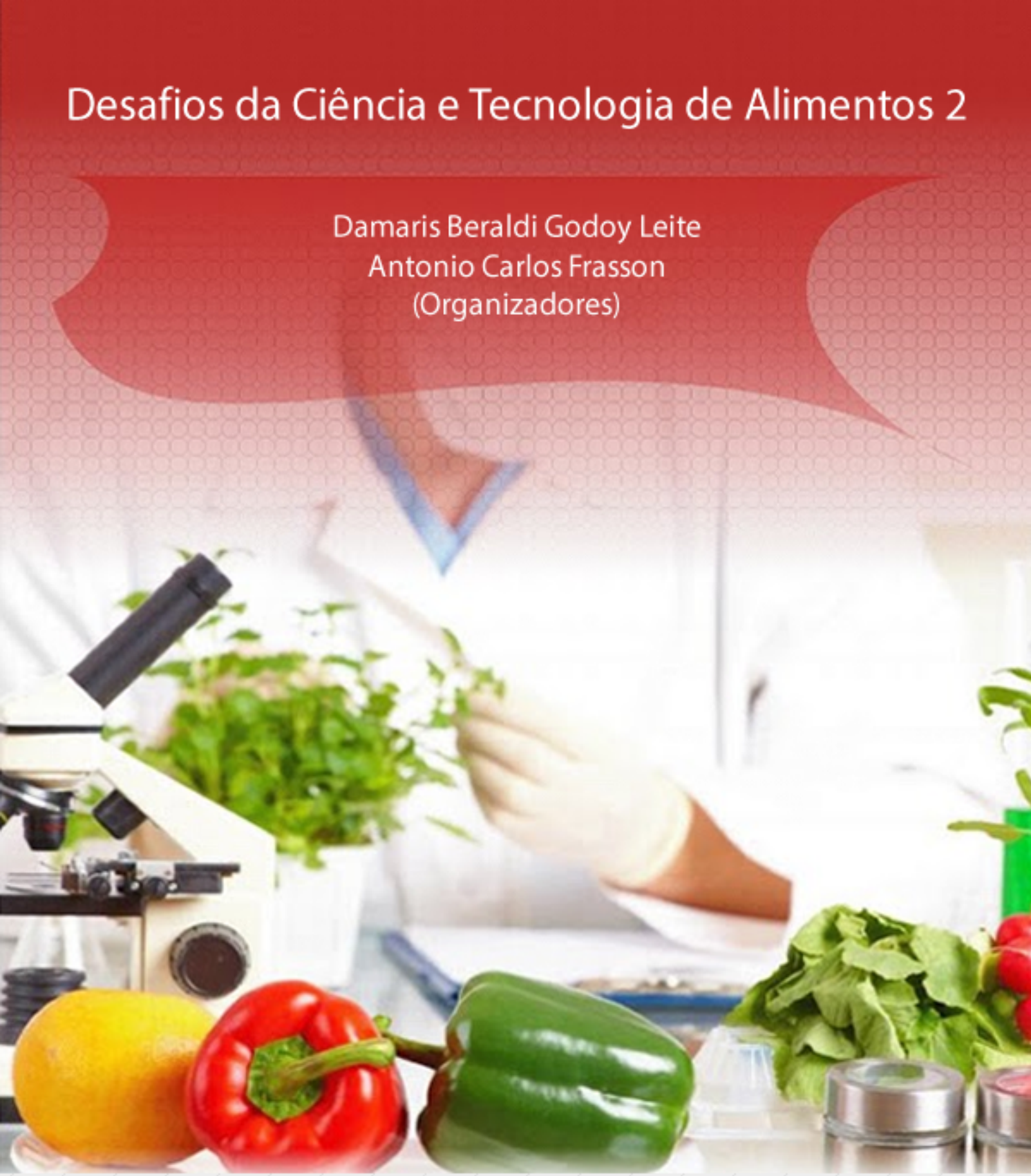
(Organizadores)



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Apresentação

A saúde é um completo estado de bem-estar, físico, mental e social, e não apenas a ausência de doenças, ingerir alimentos seguros e nutritivos é parte do processo de saúde do ser humano e para alcançar esses objetivos necessita-se do controle de qualidade.

Ao discorrer sobre o controle de qualidade Germano e Germano (2008) comentam que o controle alimentar é eficaz na medida que possui o apoio da população e da opinião pública, pois a educação deve preceder a lei, pois ela, por si só, não melhora a qualidade dos alimentos.

Para que esse controle seja plenamente atingido, juntamente com o incremento da legislação, devem-se aprimorar os procedimentos de laboratório para avaliação do produto em todas as fases do processo, a fim de garantir o controle higiênico-sanitário dos alimentos.

Dentro do território nacional o consumidor possui o Código de Defesa do Consumidor, Lei n. 8.078/90, um poderoso instrumento para que o cidadão possa se resguardar dos maus serviços e garantir os mesmos direitos básicos em relação a saúde e a segurança, bem como possui o suporte da Agência Nacional de Vigilância Sanitária (ANVISA), agência reguladora que exerce o controle sanitário sobre alimentos, regulamentada sob a Lei nº. 9.782, de 26/01/99.

No que concerne a segurança alimentar e ao controle de qualidade, o país dispõe de mecanismos próprios de fiscalização e controle, para que o alimento tenha o mais rígido controle de qualidade, estimulando estudos aprofundados nessa área, pois esse tema é profícuo em desafios.

Caro leitor, nesse volume você encontrará 17 artigos que discorrem sobre o Controle de Qualidade, especificamente relacionados aos alimentos e seus subprodutos das mais variadas regiões do Brasil, o que nos leva a pergunta inicial: O que é Controle de Qualidade?

Certamente existem muitas respostas para essa pergunta, mas ao ler esse *e-book* você certamente, poderá vislumbrar essa resposta por meio do olhar de seus autores que o fizeram com análises centesimais, químicas, físicas, microbiológicas, contagem de bactérias, estudo de peptídeos, avaliação de rótulos, potencial antioxidante e nutricional.

Ao usarem métodos diversos para alcançarem objetivos variados, com o intuito de garantir a qualidade final dos diferentes produtos apresentados no *e-book*, foram realizados testes em diferentes momentos da vida de prateleira do produto, o que propiciou visões diversas sobre o comportamento desses ingredientes e/ou produtos, demonstrando a criatividade e precisão dos autores.

Apreciem a leitura e atentem-se para os achados na avaliação físico-química de produtos diferenciados, as novidades dos compostos antioxidantes, o incremento no portfólio de produtos inovadores e subprodutos anteriormente

descartados, demonstrando a visão de um mundo sustentável onde as culturas são respeitadas e o material biológico é visto em sua integralidade.

Desejamos a todos uma boa leitura e enriquecimento com o estudo dos textos!

Damaris Beraldi Godoy Leite
Antonio Carlos Frasson

Sumário

Capítulo IV

THE QUALITY OF INDUSTRIAL AND HOMEMADE COCONUT OIL (EXTRA VIRGIN) SOLD IN VITÓRIA DA CONQUISTA-BA

Adriana da Silva Miranda
Jamille Nunes Pereira
Renata Ferreira Santana
Fábio Pereira de Souza
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Maria Helena Santos Oliveira

THE QUALITY OF INDUSTRIAL AND HOMEMADE COCONUT OIL (EXTRA VIRGIN) SOLD IN VITÓRIA DA CONQUISTA-BA

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ABSTRACT: Coconut oil, has been studied for presenting several benefits to human health. However, in order to ensure such effects, itmust present a good bromatologic quality. This study aimed to evaluate the physical and chemical quality of the extra virgin and homemade coconut oil sold in Vitoria da Conquista, Bahia. The oils were purchased in natural products shops and fairs. Then, they were evaluated for: humidity, density, acidity, % of Lauric acid, smoke point and solubility analysis. All analyzes were performed according to the Adolfo Lutz Institute (2008). We considered: moisture, density, acidity, % lauric acid and smoke point. We had 0.17; 0,878; 0.49; 2,026 and 200° C respectively for the industrially processed oil and 0.16; 0,885; 1.09; 4.51 and 180° C for the homemade oil. For its solubility, the analyzed oil was only soluble in petroleum ether. We concluded that the homemade oil had a lower quality than the industrialized oil.
KEYWORDS: Nucifera Coconuts; Fatty Acids; Quality Standard.

1. INTRODUCTION

Coconut (*Cocos nucifera L.*) belongs to the *Arecaceae* family (Palmae) and to the *Cocoideae* subfamily. The Coconut palm (*Cocos nucifera*) has its origin in Southeast Asia, it was inserted in Brazil in 1553, and, because of its easy adaption to the Brazilian soil, it seems to be well adapted tothe long areas

of the northeastern coast (FERREIRA et al., 1994; JESUS JÚNIOR et al., 2013; DEBMANDAL; MANDAL, 2011). Most countries, which grow this palm tree, commercially take advantage of its dry pulp, also known as ‘copra’ for producing oil and dehydrated coconut, while in Brazil, the coconut palm tree is grown in order to produce fruit for agribusiness, mostly for grated coconut, coconut milk and coconut water (EMBRAPA, 2014).

The coconut oil production has recently been put in evidence for being a basic substance for many pharmaceutical products, for biofuel production and for the food industry, where its use is based on the function of lauric acid in various processes. This fatty acid has been found in greater proportion in the coconut copra (KUMAR, 2011). In addition to that, some studies have presented several advantages for this oil consumption,as in the reduction of body fat and therefore, for weight loss. It also prevents Alzheimer's disease (ASSUNÇÃO et al., 2009; GIUSTINA, 2014; CARDOSO et al., 2015; FERNANDO et al., 2015).

The coconut oil has a higher amount of MCFA, which assigns a different metabolic behavior due to its structural characteristics. The MCFA is rapidly absorbed into the intestine, even without undergoing the action of pancreatic lipase enzyme. Where they are transported by the portal vein to the liver, where they are rapidly oxidized, generating energy. Unlike LCFA, the MCFA does not take part in the cholesterol cycle and it is not stored in fat deposits (LIAU et al., 2011).

However, one must acknowledge the quality of the oils used for consumption, since these substances are easily oxidizable, therefore, resulting in the production of free radicals which, in the human organism, are associated with many harmful effects such as the development of cancer, premature aging, among others (FARHOOSH et al., 2009; WANASUNDARA; SHAHIDI, 2005; THODEFILHO et al., 2014).

It is necessary to be careful in order to slow the oils oxidation. The main factors contributing to accelerate the oxidation process are: the presence of contaminants such as the metals that are present with more than one valence state (iron, copper, cobalt). The presence of fatty acids can trigger a chain reaction; exposure to oxygen. The presence of water, temperature and light affect the stored product (OETTERER et al., 2006; THODEFILHO et al., 2014). These may directly influence the oils quality.

Lipids are a group of foods that can easily compromise their quality. This study aimed to evaluate the physiochemical quality of the extra virgin and homemade coconut oil sold in health food stores and on the open fairs in Vitória da Conquista- Ba.

2. MATERIALS AND METHODS

The analysis were conducted in an experimental procedure in the

Bromatology Laboratory of the Faculty of Technology and Sciences, campus Vitória da Conquista, Bahia. Initially the samples, sold in 200 mL containers, were purchased randomly from natural products stores (extra virgin oil) and from open fairs in the same city (homemade). The products were transported in their own packaging and/or kept in containers that prevented the passage of light.

For the physiochemical coconut oils test of quality, the following analysis were employed: humidity, density, acidity, percentage of lauric acid, solubility and smoke point. All analysis were performed according to the methodology proposed by the Adolfo Lutz Institute (2008).

Humidity was determined by the gravimetric method at 105° C to constant weight. To evaluate density, we have used a test tube of 25 ml previously weighed, it was filled with 10 ml of oil and weighed on a scale, the weight was then registered. On the quantification of titratable acidity and percentage of lauric acid, a mass of 2.0g sample was homogenized in a mixture of ether and ethyl alcohol in a ratio of 2:1. Then a titration was carried out with standard solution at 0.1N of sodium hydroxide until the appearance of a pink color, using as solution indicator of phenolphthalein. To obtain the smoke point, the coconut oil underwent heating until the appearance of a whitish smoke, the value of the temperature and the analysis of solubility were registered as long as they appeared. The solubility of the coconut oil sample was analyzed, in an aqueous solution, alcoholic (ethanol), and in petroleum ether. For implementation, we pipetted 1 ml of oil and kept it in labeled test tubes, then we added to the oil, 1 ml of the following solutions (water, ethanol and petroleum ether). The samples were homogenised for 1 minute on a tube shaker, after that, they stood still so the results could be read. In each lot triplicate readings were performed, and the results were expressed as mean standard deviation (SD).

3. RESULTS AND DISCUSSION

3.1 Physiochemical characterization of oils

The analysis showed no statistical differences between the samples tested. The physicochemical parameters evaluated for the extra virgin coconut oil and the homemade sample are listed in Table 1.

Table1 - Physiochemical analysis of the Industrial (extra virgin) and homemade coconut oil

Treatments	Humidity (%)	Density	Accidity (mg/NaOH)	% Lauric Acid	Smoke point
IOP -1	0.17±0.00[a]	0.87±0.00[a]	0.50± 0.00[a]	2.05±0.00[a]	200º C±0.03
IOP -2	0.16±0.00[a]	0.88±0.00[a]	0.49±0.00[a]	2.06±0.00[a]	*
HOP -1	0.15±0.00[a]	0.88±1.35[a]	1.09±0.02[a]	4.51±0.09[a]	*
HOP -2	0.16 ±0.00[a]	0.88±0.00[a]	1.08±0.02[a]	4.50±0.09[a]	180º C±0.02

IOP - extra virgin Industrial Oil Production; HOP - Homemade Oil Production. Means followed by the same letter do not differ statistically from each other. Tukey test was used to level ($p < 0.05$). *Point has not been made for these treatments.

The Ministry of Agriculture, Livestock and Supply, through the Normative Instruction Nº 49, from December 22, 2006, determines an approximate value for vegetable oils of 0.1. According to the results obtained in this study, both the industrial and the homemade coconut oil showed values close to the one mentioned by the legislation. This data is very important since the presence of water in foods, particularly rich in oil/fat, can contribute significantly to the oxidative process, since the water acts favoring the process of food hydrolysis, with consequent production of fatty acids, which reduces the product stability.

According to current legislation (BRAZIL, 1999), the standard for coconut oil (per gram) is 0,908 – 0,921 and, as shown in Table 1, the value found for the industrial and homemade coconut oil, is below the recommended. However, it is noteworthy that a relatively small change in temperature can significantly affect the density value, while the pressure change has to be relatively high for the density value to be affected.

The acid level reveals the oil conservation state. According to the current legislation (BRAZIL, 1999), the standard for coconut oil is less than 0.5. Therefore, the high acid value in the homemade coconut oil indicates that it has been suffering breaks in its chain, releasing its key constituents: fatty acids. In the case of the industrial coconut oil, it is within the current legislation, however, it presents on its label a lower value than the one found (<0.3). Santos et al. (2013) after evaluating the acid number found for the industrial coconut oil the value of 0,558, a similar value to this work (0.49) and for homemade coconut oil, it was found the value of 0,837, lower than the one found in this work (1,095).

According to the % of lauric acid, this study showed that there was lowerconcentration for the industrialized coconut oil when compared to the homemade one, considering that the last one is on its standard. According to the Brazilian's current legislation (Brazil, 1999), the value per gram stays between 4.3 and 5.1. This difference between the values may be due to temperature employed in the homemade processing which could increase the saturation degree, or adding other compounds to the industrial coconut oil with subsequent reduction of its saturation.

It is important to notice that the lauric acid is the main fatty acid present in this kind of oil, called Medium Chain Triglycerides (MCTs), which is

responsible for the various benefits of coconut oil, being related to the product oxidative stability, changing the melting profile by increasing the use of these fats in specific products. Moreover, they are responsible for the reduction in serum levels of fats and weight reduction when combined with physical activities.

The industrially produced oil presented ahigher smoke point than the homemade produced one, which means, it deteriorates at a higher temperature. According to Freire et al. (2013) the time-heating temperature binomial is a major factor during the frying process, a longer frying time turns into an increased level changing with the formation of various compounds, followed by the stability of these elements.

Taking into account the importance of the time-temperature binomial, one can not conduct a comparison with other experiments, considering that the heating speed as well as the starting temperature employed in the experiments were not counted, being different in all cases.

During the evaluation of the coconut oil solubility, we observed that the two layers do not completely mix into a cloudy mixture. Despite the oil molecules being attracted by the water molecules, this force of attraction is smaller and it does not allow the complete dissolution of both sides. In the oil and ethanol mixture, there was a formation of small oil bubbles and subsequent separation of the two layers just after standing still, it is justified since the alcohol has a low solubility in oils, besides the difference in density of the compounds. The oil, since it is denser, stood at the bottom of the tube, while the alcohol was at the top due to its low density. In the ether oil mixture there was a completely dissolution, the ether is an organic solvent with nonpolar characteristics as the oil, so there is total solubility of these two compounds.

4. CONCLUSION

In view of the data, we can conclude that the homemade coconut oil has lower quality than the industrialized one, a factor evidenced by the high acid value, which indicates that the homemade coconut oil is already in an oxidative process that can be derived from improper processing and storage. We also emphasizes that the consumer should better select the products to be acquired, since the oxidation of these oils and their consequent consumption are associated with the development of diseases caused by the action of free radicals.

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RESUMO: O óleo extraído do Cocos Nucifera, tem sido foco de estudo por apresentar vários benefícios a saúde humana devido a presença de Triglicerídeos de cadeia media, no entanto, nem sempre estes são de boa qualidade, fator que objetivou avaliar a qualidade físico-química do óleo de coco extra-virgem e artesanal, comercializados em lojas de produtos naturais e na feira livre de Vitória da Conquista-Ba. Os óleos foram avaliados quanto: Umidade, Densidade, Acidez, % de ácido Láurico, ponto de fumaça e análise de solubilidade. Observou–se para umidade, densidade, acidez, % de ácido láurico e ponto de fumaça: 0,17; 0,878;0,49; 2,026 e 200ºC respectivamente e para o óleo de processamento indústrial 0,16;0,885; 1,09; 4,51 e 180ºC para o óleo processado artesanalmente. Quanto a solubilidade o óleo foi solúvel apenas em éter de petróleo.Portanto conclui-se que maiores cuidados devem ser tomados durante o processamento e armazenamento dos óleos comercializados.
PALAVRAS-CHAVE: Cocos Nucifera; Óleo; Padrão de Qualidade.