HEADCHEESE AS AN ALTERNATIVE USE OF PORK BYPRODUCTS: PHYSICOCHEMICAL ANALYSIS AND TEXTURE PROFILE.

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Abstract – This paper aims to present the Brazilian product known as "queijo de porco", literally "pork cheese", and well known in English speaking countries as "headcheese". The headcheese is originated in Europe and was brought to South America through immigrant peoples. The product is widely consumed by European descendants who settled in southern Brazil and is increasingly being inserted into the Market; however, not with deep-seated standards of identity and quality. It is produced according to different methodologies in each the different region of Brazilian southern States. Thus, the object of the present work is to serve as a start-up for the characterization of such product so that it may serve as a basis for further standards of Identity and Quality. Characterization to determine the proximate composition was performed and the following data was respectively obtained: 54.14; 20.88; 15.04 e 7.63g/100g of moisture, protein, lipid and ash. Calorific value was calculated from the proximate composition resulting 228.12Kcal/100g. Results for the texture profile have presented it as a tender product; but to confirm such hypothesis, however, sensorial analysis is necessary. Complementary studies are ongoing in order to increase the knowledge over the profile of the product.

INTRODUCTION

Headcheese is a product derived from pork and made of pork slaughter byproducts (edible offal). Its origin is intertwined with the beginning of the production of *pork delicacies* in old Europe. Traditionally, noble cuts were consumed with almost no need of any processing, or used to prepare the main types of *delicacy* pork products (sausage and salami). In such context, headcheese emerged as a way of using the whole pork; being formulated from different less noble pork cuts, the head, and other pork trimmings, then stuffed into pork stomachs [1-4]. In category of products similar to the headcheese, several authors refer to suchlike products or those that use the same basis. In England, there are accounts of a similar product named "brawn" (which in Portuguese would be strictly translated as "muscle"). In other English language speaking countries there are also reports of the so called "headcheese". In Spanish speaking countries, the same product is mentioned as "queso de cabeza" [5]. The term *headcheese* is used in North America, *brawn* in Britain and Australia, though more commonly *potted heid* is used in Scotland. The term *souse* for the pickled variety is North American and West Indian (http://en.wikipedia.org/wiki/Head_cheese).

Brought to Brazil with the European immigration in the late nineteenth century, the product has widely been accepted in regions colonized by Germans, Italians and Poles [6]. This work highlights the west region of the Santa Catarina State, as it is the major producer of swine in Brazil with the presence of the major agribusiness companies of the sector [6-8].

What we now perceive is the transformation of a handcraft product into an industrial product, produced in medium or large scale. Each company has adapted the product on its own, making the use of different formulations and processes, leading it to the mischaracterization and making it often different from the original product, thus causing confusion among consumers.

In practice, industries produce the headcheese aiming to use those byproducts from slaughtered animals, not used to manufacture other types of delicacy pork products, such as cured and smoked cuts, sausage, salami, pork rind and lard. It is, thus, an opportunity to increase the "value added" of products through industrialization, and to increase the shelf life of meat trimmings, heads, feet, and other less noble cuts such as liver, heart and kidneys, which do not usually have good prices nor even are well accepted by the marketplace.

There is scant literature on physicochemical aspects of the headcheese. Much of what is known comes from international sources [9,

10] or from the area of gastronomy [4, 11]. In Brazil, there are no studies addressing the headcheese, and there are outdated data and technical communications [3, 12]. Brazilian legislation does not establish minimum standards of identity and quality for this type of product and does not directly mention the term "headcheese" which is generally treated as cooked *pork delicacy*. The only direct reference is a decree from the State of São Paulo [13].The other states of the Brazilian Federation have no specific legislation.

This paper aims to start the description of the flowchart of production as well as of the physicochemical characteristics of headcheese manufactured in an industry of Santa Catarina, southern Brazil, inspected by an integrated agricultural development company called Companhia Integrada de Desenvolvimento Agrícola de Santa Catarina – CIDASC [14].

MATERIALS AND METHODS

Sampling: were collected three product batches, where lots were created in line production industry. The batches were produced in different times, and in each three samples were collected 500g each and all analyzes were performed in triplicate

Proximate analysis and energy value: Ash, moisture, total lipids and protein values were determined according to AOAC standards by protocols 923.03, 925.09, 925.38 and 920.87, respectively [15]. The carbohydrate content was obtained by the difference between 100% of the sum of the percentages of moisture, ash, protein and total lipids. The energy value was the result of the sum of the levels of carbohydrates and proteins, multiplied by four, and total lipids multiplied by nine [16].

Water activity and pH: Water activity (a_w) was determined by a water activity analyzer (Decagon, Washington, USA). The pH was measured through direct reading with the use of a pH meter equipped with a penetration electrode [17].

Instrumental Texture Analysis: Hardness, adhesiveness, brittleness, cohesiveness, springiness, gumminess and chewiness were analyzed. From each batch analyzed 30 cylinders were cut measuring 2 cm diameter and compressed twice to 50% of its size, no time to rest between the two compression cycles. The deformation curve over time was obtained with a compression speed of 4 mm/s Pressure 0.1 N [18] using probe P/40.

RESULTS AND DISCUSSION

The Headcheese is manufactured with a mixture of pork meat prepared with head, ears, snout, cheeks and other gelatinous parts of the head and skin; it is then flavored with spices, stuffed in pork bungs or stomachs and then cooked, it can be pressed or not. Although it can be smoked, it must always be boiled in water. Based on this information and through the actions with the producers of the State of Santa Catarina - BR,

One should notice that there are no set patterns of Identity and Quality for the product studied herein, since few years ago it was solely considered as a handmade product concerning a small portion of the population. However, such a scene is quickly being modified, leading it to the need of legal documents so that the product might have pre-established standards. Table 1 presents the proximate composition of the product; however, there are no data that can be directly compared to what is shown.

Table 1 – Averages (g/100g) followed by the standard deviation of analyzes performed to determine the proximate composition of headcheese and its energy value (kcal/g) calculated based on the obtained data.

	Average
Moisture	54,14 (±3,35)
Protein	20,88 (±3,03)
Lipid	15.04 (±2.72)
Ash	7.63 (± 2.09)
Carbohydrate	2.31*
Energy value	228.12**

* Difference between 100% and the sum of the percentile of Moist, Protein, Lipid and Ash.

** Value obtained by the calculation: Sum of Carbohydrate, Protein (x4) e Lipid (x9).

For general comparison it was used a similar "headcheese" product from a different country, which contains an average 14g%, 11g%, and 9.05g% of protein, lipid and mineral residue (ash), respectively, and 157Kcal/100g [19]. Obtained values in this study are consistent with those from the reviewed literature, as great similarity was observed.

According to Matos *et al.* meat products with water activity lower than 0,95 and pH lower or equal 5,3 was considered stable in room temperature [20]. Through observed data on Table 2, it is possible to confirm that water activity is favorable to products with longer shelf life, however, pH shows higher levels, what leads to the need of product refrigeration during storage. In a study conducted by Francois *et al.* (2009), pH 5.39 e a_w 0.807 were obtained for fermented *pork delicacies* [21]. As the product in question did not go through fermenting process, its pH value does not decrease during the processing.

Table 2 – Average values of standard deviation to determine water activity (a_w) and pH

	Average
a_w	0.84 (± 0.01)
pH	6.02 (± 0.05)

Another aspect to be considered in this work was a concern in mapping the texture of the product, since it is protein rich, specifically collagen. It is known that the mechanical features of texture provide important information about the sensory properties of products. Table 3 shows data obtained for the texture profile of the headcheese.

Table 3 - Average value obtained for headcheese texture profile followed by standard deviation

	Average
Hardness	154.06 (±31.46)
Brittleness	56.08 (±18,23)
Cohesiveness	0.83 (±0.15)
Springiness	97.71(±26.83)
Gumminess	125.34(±32.03)
Chewiness	126.56(±38.29)

No values were obtained concerning texture profile that could classify it as a tender product; however, a sensorial study with consumers is indicated to come to such conclusion and to obtain comparison parameters between sensorial and mechanic methods.

CONCLUSION

From data obtained we could conclude that the product known in Brasil as "Queijo de Porco", literally "Pork Cheese", and known in English as "Headcheese", features physicochemical characteristics that need greater care, such as refrigeration during storage periods. No relevant information about headcheese characterization was obtained during the review of Brazilian literature; thus the present work stands as a pioneer on the subject so that, in near future, there can be a reference for researchers, producers and for public departments, with more information over the topic. However, it should be emphasized that other aspects of the constitution of the product are still being studied, such as: collagen content, minerals and fatty acid profile.

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