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Herbs-based seasoning as a strategy for reducing the sodium offer for consumers of a food and nutrition unit

Tempero à base de ervas como estratégia para redução da oferta de sódio para comensais de uma unidade de alimentação e nutrição

Abstract

Objective: This study aimed to evaluate the use of a herbs-based seasoning in protein preparations as a strategy for reducing sodium intake by diners served at a Food and Nutrition Unit (FNU). *Material and Methods*: This was a cross-sectional study carried out in a FNU factory. The herbs-based seasoning was developed with the help of the unit's cooks. The proximate composition of protein preparations was determined with the aid of food composition tables. To assess the acceptance of the preparations, a sensory analysis was performed for two culinary preparations: chicken breast and beef chuck steak added with the herbs-based seasoning. The following attributes were considered for evaluating colour, texture, aroma, appearance and overall evaluation, on a 9-point hedonic scale ranging from "I disliked a lot" to "I liked a lot". The acceptability index was also calculated for all attributes. *Results:* Forty-one consumer judges were recruited to perform the sensory analysis. There was an important reduction in sodium levels of 60.2% (from 939.2 mg to 375.3 mg) and 23.3% (from 709.7 mg to 544.0 mg) per 100g of chicken breast and beef chuck steak, respectively, and an increase in the fiber content of the preparations that received the herbs-based seasoning. The global acceptance index of seasoned chicken breast and beef chuck steak was 87.8% and 83.8%, respectively. *Conclusion:* The substitution of ultra-processed seasoning for herbs-based seasoning in protein preparations was well accepted among FNU diners.

Keywords: Salt. Food Composition. Collective Feeding. Occupational Groups

Resumo

Objetivo: O objetivo deste estudo foi avaliar o uso de um tempero à base de ervas em preparações proteicas como estratégia para a redução da ingestão de sódio por comensais atendidos em uma Unidade de Alimentação e Nutrição (UAN). *Material e Métodos:* Trata-se de um estudo transversal realizado em uma UAN de uma fábrica. O tempero à base de ervas foi desenvolvido com o auxílio das cozinheiras da unidade. A composição nutricional das preparações proteicas foi determinada com o auxílio de tabelas de composição de alimentos. Para avaliar a aceitação das preparações, foram realizadas análises sensoriais de duas preparações culinárias: peito de frango e acém bovino adicionados do tempero à base de ervas. Foram considerados os seguintes atributos: cor, textura, aroma, aparência e avaliação global, em uma escala hedônica de 9 pontos que varia de "desgostei muitíssimo" a "gostei muitíssimo". O índice de aceitabilidade também foi calculado para todos os atributos. *Resultados:* Quarenta e um juízes consumidores foram recrutados para realizar a análise sensorial. Houve

uma redução importante nos níveis de sódio de 60,2% (de 939,2 mg para 375,3 mg) e 23,3% (de 709,7 mg para 544,0 mg) por 100g de peito de frango e acém bovino, respectivamente, e um aumento no teor de fibra das preparações que receberam o tempero à base de ervas. O índice de aceitação global de peito de frango temperado e filé de carne bovina foi de 87,8% e 83,8%, respectivamente. *Conclusão*: A substituição de temperos ultraprocessados por temperos à base de ervas em preparações de proteínas foi bem aceita entre comensais da UAN.

Palavras-chave: Sal. Composição de alimentos. Alimentação coletiva. Trabalhadores.

INTRODUCTION

Systemic arterial hypertension (SAH) has become one of the greatest public health challenges worldwide, besides, it is the principal risk factor for premature death worldwide.[1,2] In Brazil, according to data from the Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey, 24.5% of the population residing in the capitals and the Federal District reported having a medical diagnosis of hypertension. This was higher in women (27.3%) than in men (21.2%) and increased with age.[3] Several factors are associated with the development and worsening of SAH, and among the modifiable risk factors are overweight, smoking, alcoholism, physical inactivity and excessive sodium consumption.[4-6] High sodium consumption is the main modifiable risk factor for the development of arterial hypertension and is associated with stroke, left ventricular hypertrophy and kidney diseases.[4,6] In Brazil, based on an analysis of data from the 2017-2018 "Pesquisa de Orçamentos Familiares" (POF), sodium intake above the limit was personalized by 53.5% of the population, mostly coming from table salt.[7]

The advances observed in urbanization and industrialization have driven changes in eating patterns around the world. The ease of access in urban centres and in the countryside, the insertion of women in the labour market and the shorter time available for food preparation are the main facts related to the increase in the practice of eating outside the home, as well as an increase in consumption of pre-cooked foods with a high content of sodium, fat and sugar.[8,9] In this perspective, the Food and Nutrition Units (FNU) emerge as a tool that can contribute to an adequate and healthy diet outside the home, considering that the purpose of this is to provide safe food to guarantee the necessary nutrients to maintain or recover the health of their guests.[10]

In Brazil, instituted by Law No. 6,321/1976, the "Programa de Alimentação do Trabalhador" (Worker's Food Program - PAT) aims to guarantee the right to food among workers and improve food and nutrition policies aiming at disease prevention.[11] However, nutritional parameters are often inadequate in meals offered by FNU, where it is possible to observe high levels of energy, lipids and sodium.[12-14]

It is known that small reductions in sodium intake promote beneficial effects on the health of the population, being able to decrease blood pressure levels and the risk for the development of cardiovascular diseases.[6] Thus, strategies have been evaluated to promote sodium reduction in preparations and food products without interfering in their acceptance by diners and consumers. The substitution of sodium chloride for other salts, such as potassium chloride, seems to have a negative influence, depending on the proportion of substitution adopted, in accepting the products due to the residual flavour.[15] Herbal salt is another alternative, as in this product, part of the salt is replaced by various spices and herbs and can be added in any preparation to replace the salt, enhancing the flavour of the food; also, these components can be considered food with functional properties, that is, they have compounds that provide health benefits.[16] Therefore, this study aimed to evaluate the use of herbs-based seasoning in protein preparations as a strategy to reduce sodium intake by diners served at an FNU.

MATERIAL AND METHODS

Design and location of the study

This is a cross-sectional, observational, and quantitative study carried out in an FNU of a ceramic tile factory located at the José Aprígio Vilela Industrial Pole in Marechal Deodoro (AL). The data collection occurred in two consecutive days during December 2018.

FNU's management was outsourced. The menu offered by the unit served employees of the factory's administrative and operational sectors. The modality was self-service, where the customer served himself at will, with only the proteins provided by a trained FNU employee. Three hundred seventy daily meals were offered, distributed in lunch (200), afternoon snack (50), dinner (70) and evening snack (50). Lunch consisted of four types of salad, two

types of rice, two types of beans, two garnishes, two protein dishes and a choice of boiled or fried egg, two flavours of juice and a dessert. At dinner, the menu followed the lunch pattern, except for salads, where only two options were offered. Two filling options were offered for snacks provided for roll, a flavour of juice and coffee. Despite the FNU offering lunch and dinner, data collection occurred only at the time when lunch was served, as this was the meal with the largest number of consumers. Data collection took place over two consecutive days to reach both groups of industry employees who are served by the FNU.

Sample planning

The sampling used was non-probabilistic for convenience, and the recruitment of participants took place by direct invitation. This study included employees legally hired by the company, over 18 years of age, and both sexes. At the time of the invitation to participate in the research, participants were informed of the ingredients contained in the preparation; thus, we did not include individuals with allergies or intolerances to the foods involved in the preparations or who did not like the ingredients of the recipe, and those with clinical conditions that interfered in the sensory analysis of the preparations.

Herbs-based seasoning and samples for sensory analysis

The herbs-based seasoning was based on the herbal salt proposed in the "Guia de boas práticas nutricionais: restaurantes coletivos"[17] and the changes were developed with the help of the FNU cooks, considering that this is the professional who has greater knowledge of the best combinations of spices to ensure greater acceptance of the product. The final seasoning developed included: sea salt (33.3%), basil (*Ocimum basilicum*) (17.8%), parsley (*Petroselinum crispum*) (17.8%), rosemary (*Rosmarinus officinalis*) (6.6%) and orégano (*Origanum vulgare*) (24.5%), all herbs used were dehydrated. After selecting the ingredients, they were ground with the help of food processor. The centesimal composition of the herb-based seasoning per 100g was as follows: 1, 017.1KJ/243.0Kcal of energy, 40.0g of carbohydrates, 9.5g of proteins, 5.0 g of lipids, 15.0g of fibers, and 13,012mg of sodium.

Protein preparations were selected from the FNU menu considering the greater frequency that they were offered and that contained ultra-processed spices in their preparation form. In this way, chicken breast and beef chuck steak were selected for the acceptance test. After selecting the protein preparations that would have industrialized seasoning replaced by herb-based seasoning, two researchers and two FNU cooks performed three tests with different proportions of ingredients until there was consensus on poultry meat and beef recipes to be evaluated for their acceptability. For chicken breast, the following ingredients were used: chicken breast (1.6 kg), paprika (15 g), herbs-based seasoning (40 g) and soy oil (20 g). For beef chuck steak, beef was used (1.6 kg), herbs-based seasoning (60 g) and soy oil (20 g). The seasoning was added to the meats about 20 minutes before preparation. At the time of preparation, the soy oil was poured into the hot plate and the meat was added until thoroughly cooked, about 12 minutes over medium heat.

Nutritional composition

To determine the nutritional content (energy, carbohydrates, proteins, lipids, fibers and sodium) of the herbs-based seasoning and protein preparations, the net weights of each ingredient used were considered and their composition was consulted in the following order of preference: Food Composition Table (TACO),[18] Philippi food composition table[19] and labels.

Sensory analysis

The acceptability of samples prepared with herb-based seasoning was assessed by consumer judges by applying the affective acceptance test on a hedonic scale, which expresses the emotional state or affective reaction of the consumer about the product.[20] The selection of judges occurred randomly among FNU's guests in a way that allowed the participation of employees from different sectors of the factory. The judges were instructed in a clear, objective and direct way as to the analysis procedures, filling in the sensory evaluation sheet and only essential information about the tests was provided.

The tests took place in the factory's cafeteria, where there was enough space to accommodate the sample and the judge properly. With walls in neutral colours, air conditioning and the sample preparation area were far from odours that could influence the analysis addition to counting with natural light. Before eating lunch, each judge received a sample of each preparation (first a sample of chicken breast and, later, beef chuck steak added herbs-based seasoning), the samples were delivered on white, clean, smell-free porcelain plates, in standard sizes and sufficient for the test, containing 30g of each preparation and a minimum temperature of 65ºC.[20] When changing the sample, the judges were instructed to rinse the mouth with water. The samples were identified with a sequence of 3-random numeric digits, and the judges received the sensory evaluation sheet of the sample identified with their sequence containing a hedonic scale of nine points,[21] ranging from "I really disliked" (1) to "I liked it a lot" (9) that were attributed to the attributes colour, texture, flavour, appearance and global acceptance. Also, age, sex and sector data were collected where the judge performed his professional function.

The acceptability index (AI) was calculated for colour, texture, flavour, appearance and global acceptance. The equation used for this calculation was AI (%) = B x 100 / C, with "B" being the average grade assigned and "C" the maximum grade assigned. It was considered as good acceptance when the attribute reached an AI equal to or greater than 70%.[21,22]

Statistical analysis

Data were presented as mean and standard deviation for continuous variables and frequency for categorical variables. Initially, the behaviour of the variables was verified with the normality test and regarding the homogeneity of the variance of the errors (Levene's test). In addition, the *t*-test for independent samples was applied to compare the means between the attributes of protein preparations seasoned with herbs-based seasoning, and when the distribution was not normal, the Mann-Whitney test was performed. An alpha value equal to 5% was adopted. All analyses were conducted with the aid of the statistical software R (R Foundation for Statistical Computing, Vienna, Austria), using the Rcmdr package.

Ethical aspects

This research was approved by the Research Ethics Committee of the Federal University of Alagoas (process number: 3,138,957). Participants were included after clarification, acceptance and signing the Free and Informed Consent Form.

RESULTS

The nutritional composition of the preparations that involved chicken breast and beef chuck steak seasoned with the herbs-based seasoning and the FNU standard seasoning is described in table 1. There was a significant

reduction in the sodium content of 60.2 % (from 939.2mg to 375.3mg) and 23.3% (from 709.7mg to 544.0mg) per 100g plated chicken breast and beef chuck steak, respectively, and an increase in the fiber content of the preparations they received the herbs-based seasoning.

Table 1. Centesimal composition of chicken breast and beef chuck steak prepared with herbal seasoning and standard ultra-processed seasoning served at the Food and Nutrition Unit. Marechal Deodoro, Alagoas, 2018.

Variables	CBHS (100g)	CBSS (100g)	BCHS (100g)	BCSS (100g)
Energy (KJ/Kcal)	560.2/133.8	552.7/132.0	953.3/227.7	922.8/220.4
Carbohydrates (g)	1.7	0.2	1.5	0.5
Proteins (g)	21.8	21.5	27.7	27.3
Lipids (g)	4.4	5.0	12.3	12.1
Fibers (g)	0.5	0.0	0.6	0.0
Sodium (mg)	375.3	939.2	544.0	709.7

CBHS: chicken breast with herbs-based seasoning; CBSS: chicken breast with standard seasoning from the Food and Nutrition Unit; BCHS: beef chuck with herbs-based seasoning; BCSS: beef chuck with standard seasoning from the Food and Nutrition Unit.
Source: the authors

The group of judges who participated in this study showed an average age of 32 ± 8 years (min: 22; max: 53 years), 41 diners were included, 80.5% (n = 33) being male and 19.5% (n = 8) being female, 43, 9 % (n = 18) and 56.1% (n = 23) were from the administrative and operational sectors, respectively.

The affective type sensory analysis results are provided in table 2, which contains the averages of the notes designated for the attributes colour, texture, flavour, appearance, and global acceptance for the two protein preparations. In general, the two preparations have a good performance in accepting the judges, it can be highlighted that in the preparation of chicken breast, the texture and global acceptance were the attributes with the best evaluation, while in beef chuck steak, the colour presented the best performance in the sensory analyses. There was no statistical difference between the attributes of the two preparations.

Table 2. Mean and standard deviation of the score referred to the sensory analysis of chicken breast and beef chuck steak seasoned with herbs-based seasoning. Marechal Deodoro, Alagoas,2018

Attributes	Chicken breast	Beef Chuck steak	p
Colour	7.8 ± 1.2	7.9 ± 1.3	0.08[a]
Texture	8.0 ± 1.4	7.5 ± 1.7	0.12[a]
Flavour	7.7 ± 1.6	7.3 ± 1.6	0.09[a]
Appearance	7.7 ± 1.2	7.6 ± 1.3	0.09[a]
Global acceptance	7.9 ± 1.1	7.5 ± 1.5	0.23[b]

[a] p-values for comparison between the means of the variables using t test for independent samples; [b] p-value for comparison between the means of the variables using the Mann-Whitney test. The group of judges is composed of 41 individuals.
Source: the authors

Considering the AI presented in table 3, both preparations evaluated were well accepted. However, beef chuck steak added with herbs-based seasoning obtained slightly higher AI in the colour attribute (87.8%) when compared to the chicken breast (87.2%). Besides, chicken got higher AI when observing the flavour (85.3%) than beef chuck steak (81.0%). Assessing the global acceptance of the preparations, the bird had a higher AI (87.8%) than beef chuck steak (83.8%).

Table 3. Acceptability index for the attributes colour, texture, flavour, appearance and global acceptance in the sensory analysis of chicken breast and beef chuck steak seasoned with herbs-based seasoning. Marechal Deodoro, Alagoas, 2018.

Attributes	Acceptability index (%)	
	Plated chicken breast	Plated beef chuck
Colour	87.2	87.8
Texture	88.7	83.4
Flavour	85.3	81.0
Appearance	85.9	84.6
Global acceptance	87.8	83.8

The group of judges is composed of 41 individuals.
Source: the authors

DISCUSSION

The reduction of the sodium content by 60.22 and 23.35% in plated chicken breast and beef chuck steak, respectively, was made possible by using spices and herbs since they present aromatic characteristics and improve the flavour of the preparations.[23] The reduction in sodium content achieved in chicken breast is close to that evidenced in a study, which aimed to evaluate the acceptance of herbal salt in preparations by patients in hospital for cardiovascular diseases. They achieved a reduction of 73%.[16]

When observing the nutritional parameters of PAT,[24] we can observe that the substitution of ultra-processed spices with herbs did not promote important changes in the caloric and macronutrient content; however, it was possible to observe a minimal increase in the dietary fiber content of the preparations, but not an important increase.

Overall acceptance was suitable for both preparations evaluated. The average scores were higher than 7.5 for all attributes, except the flavour of the beef (table 2). Our results are slightly higher than those found in a study that aimed to test the acceptance of beef hamburgers submitted to different levels of substitution of sodium chloride for potassium chloride, herbs, and spices average of approximately 7.0.[25] Taking AI into account (table 3), our results were lower than those found in a research that sensorial analysed beef and chicken meat marinated in low in sodium complete seasoning, replacing sodium chloride with potassium chloride in percentages of 25 and 50% with the addition of aromatic and coloured herbs, the AI ranged from 86,11% to 95%.[26]

Aiming at the need to reduce sodium levels in its products, the food industry faces one of its biggest challenges: finding an alternative for the total or partial replacement of sodium chloride. Thus, other salts are chosen as options.[27] However, some studies report that full or partial substitution by salts such as magnesium chloride, potassium chloride and calcium chloride do not always have acceptance of the preparations and products in sensory analysis, since to compensate for the low salting power the amount needs to be greater and are often associated with bitter, sour and metallic flavours.[28,29]

In this context, the use of herbs and spices combined during pre-preparation, preparation or before serving makes it possible to intensify the natural flavour of the ingredients, improves the nutritional composition and the organoleptic properties, and this can contribute positively to the acceptance of this type of compounds by diners.[30]

This study has limitations. Firstly, we developed and tested only one herbs-based seasoning for both types of meat. Considering that the types of meat have different flavours and that the combination of herbs and spices may be different it is essential to evaluate the acceptance of other herbs and spices in seasonings that seek to reduce the supply of sodium in meat foods. In this sense, gastronomy must manifest itself while the art of flavours and the most qualified professional are gastronomes. It is up to the nutritionist to understand this art as a tool, which is not necessarily his professional area, and can promote better acceptance of an adequate and healthy diet. Secondly, we

believe that the findings of this study, pointing to the good acceptability of the preparations added to the herb-based seasoning, are of relevant importance for the advancement in the discussions about strategies to reduce the sodium supply, mainly in FNU. Another issue is to have tested the one herbs-based seasoning only in one FNU, limiting the inference of these results to other audiences. As for the strengths of the study, we highlight the participation of consumer judges in conducting affective type sensory analysis. This choice allows a more reliable view of the acceptance of changes in preparations by FNU diners. Finally, the herbs-based seasoning developed in this study is fast, easy to prepare, accessible and low-cost ingredients, which can be applied to FNU in different scenarios such as schools, hospitals, factories, university and popular restaurants.

CONCLUSION

In conclusion, the two preparations presented a good performance in the acceptance of the consumer judges, and it can be highlighted that in the preparation of chicken breast, the texture and global acceptance were the attributes with the best evaluation, while in the beef chuck steak, the colour presented a better performance. The substitution of ultra-processed seasoning for herbs-based seasoning in protein preparations was well accepted among FNU diners. Finally, we conclude that spices that contain lower sodium levels and are added to herbs can be an alternative to promote the reduction of sodium supply in preparations served in FNU, contributing to its main function, that of promoting health and adequate food and healthy to diners.

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Contributors

Silva Júnior AE and Macena ML contributed to the conception of the study, data collection, data analysis and interpretation and writing of the manuscript. Nascimento LBCM, Padilha BM and T.B.C.B. contributed to the writing of the manuscript and critical review of the intellectual material. All authors approved the final version of the article. Conflict of Interest: The authors declare no conflict of interest.