Reducing Fat Content of Brazilian Traditional Preparations Does Not Alter Food Acceptance: Development of a Model for Fat Reduction That Conciliates Health and Culture

Verônica Cortez Ginani; Janini Selva Ginani; Raquel Braz Assunção Botelho; Renata Puppin Zandonad; Rita de Cássia Akutsu; Wilma Maria Coelho Araújo

Abstract

The goal of this study was to develop a model that enables the substitution of fat in traditional Brazilian dishes without altering their acceptability. This model was created through a series of paired comparison tests and an approximation of the geometric mean. The results showed that substitution of fat with the addition of colorful spices and aromas was possible in a wide variety of dishes. The model was then tested in focus groups, revealing a positive acceptance of the dish reformulation. The study demonstrated that it is possible to reduce the fat content of traditional Brazilian dishes without altering their acceptability.

Keywords

Brazilian traditional foods, fat reduction, food acceptance, model development, focus group study.
Reducing Fat Content of Brazilian Traditional Preparations Does Not Alter Food Acceptance: Development of a Model for Fat Reduction That Conciliates Health and Culture

VERÔNICA CORTEZ GINANI, JANINI SELVA GINANI, RAQUEL BRAZ ASSUNÇÃO BOTELHO, RENATA PUPPIN ZANDONADI, RITA DE CÁSSIA AKUTSU, and WILMA MARIA COELHO ARAÚJO

1Grupo de Pesquisa em Qualidade Nutricional e Alimentar, Departamento de Nutrição, Universidade de Brasília, Brasília, Brazil
2Programa de Pós-Graduação em Nutrição Humana, Universidade de Brasília, Brazil
3Departamento de Nutrição, Universidade Federal de São Paulo, Brazil

Typical treatment for obesity and/or other chronic degenerative diseases should always include a dietetic approach. Diet success depends on several individual aspects, such as patient's personal motivation and attitudes; unfortunately, dietary planning does not always take into account the patient's cultural habits, which minimizes the impact of the nutritional intervention. The objective of the present study was to analyze and reduce the fat content of 10 representative recipes from Brazilian regional gastronomy, maintaining their acceptability and developing a standard protocol that could be used for improving nutritional content of any type of fat-rich traditional preparation. The recipes selected were tapioca flan (pudim de tapioca) and banana pie (torta de banana) from the northern region; hominy porridge (mungunzá) and corn cake (bolo de milho verde) from the northeast region; goianian pie (empadão goiano) and cassava cake (mané pelado) from the central west region; tropeiro beans (feijão tropeiro) and spiced chicken with rice (galinhada) from the southeast region; and carreteiro rice (arroz carreteiro) and ground corn with pork ribs.
(quirera lapiana) from the southern region. The preparations were submitted to a chemical composition analysis for humidity, protein, ashes, and total lipid content according to official methods of the Association of Analytical Chemists (AOAC, 1998) in duplicate. After the average nutrient content was determined, sensorial analysis was performed in order to investigate the acceptance rate of each preparation. The results were analyzed according to the hedonic scale of 7 points considering good acceptance those rates higher than 70%. Additionally, for statistical analysis the test F was applied, determining whether the samples were accepted significantly different to a level of 95% confidence. Some recipes had main ingredients with characteristically high lipid content, thus, in order to keep the regional characteristics of the preparation, those ingredients were not changed. Also, according to sensorial analysis, although there were some differences between the standard and modified samples, the recipes obtained similar acceptance rates ($p > 0.05$), except for carreteiro rice and banana pie recipes. In the case of the carreteiro rice, the acceptance of the modified recipe was greater than the standard and for the banana pie the inverse occurred, although the final acceptance of the modified recipe was greater than 70%. The results show that it is possible to conciliate healthy food and alimentary culture, once the adequate preparation technique is used, in particular those concerning the nutritional composition of the main ingredients (respecting the recipe characterization) and healthier methods of cooking. Moreover, those techniques can be applied for any regional/typical recipes in order to facilitate the patient’s adherence to the prescribed diet plans or even for major actions concerning public health matters.

KEYWORDS Fat reduction, nutritional composition, sensorial analysis, regional preparations, dietary techniques

INTRODUCTION

Healthy eating as a human right must be presented in a social–cultural context, associating nourishment and nutritional security. It should guarantee assistance to a population’s biological and social needs according to life phases. More than a nutrient vehicle, food must also answer to affective anxieties identifying groups and/or individuals (Brug, Kermers, Lenthe, Ball, & Crawford, 2008; Food and Agriculture Organization, 2005).
Traditional habits/food products are usually healthier than some recent habits of eating fast food products and/or high lipid/trans-fat products. Moreover, nonnutritional aspects of foods should be considered in the dietetic prescription. For this reason, food quality knowledge, environmental production conditions, system sustainability, and life quality of the population involved are fundamental (McMichael, 2009).

The use of typical foods for health benefits makes it possible to rescue regional habits and food values culturally known. Those habits are socially constructed and carry out the cultural representation of each society without, however, forgetting the basic principles of nutrition, especially the poor effects of high fat consumption. Several studies show that high dietary fat intake is associated with an increase in several risk factors of the metabolic syndrome, such as lipid storage and visceral obesity, insulin resistance, and dyslipidemia, which make these patients more prone to type 2 diabetes mellitus and cardiovascular diseases. Among dietary lipids, saturated fatty acids (SFA) are considered to exhibit the most deleterious effects because they favor lipid storage, insulin resistance, and hypercholesterolemia (Even, Mariotti, & Hermier, 2009). Moreover, consumption studies show a concerning worldwide tendency of high saturated and trans fat intake (German & Dillard, 2004; Trichopoulou & Lagiou, 1997). Studies show that people exposed to a high-fat diet display a passive tendency to overconsume energy due to the high palatability and energy density of high-fat foods, thus facilitating weight gain (Crystall & Teff, 2006; Lawton, Delargy, Smith, Hamilton, & Blundell, 1998).

The main deleterious aspects of nutritional transition are related to the increasing use of refined sugar and soft drinks and the decreasing intake of vegetables, fruits and complex carbohydrates. The adoption of Westernized dietary habits seems to be a marker of the increasing prevalence of obesity, diabetes, and coronary diseases among the population of developing countries (Astrup, Dyerberg, Selleck, & Stender, 2008).

Also concerning is the fact that the introduction of these habits affects the cultural aspects of native diets. The literature suggests that cultural dietary habits are likely to become less healthy. This acculturation process often replaces healthy dietary components of the native diet, such as fruits, vegetables, nuts, and grains (Gilbert & Khokhar, 2008).

Brazil has experienced rapid demographic, nutritional, and epidemiologic transition. With the rapid economic expansion and migration from rural to urban areas, many individuals have adopted Western lifestyle habits (Ford & Mokdad, 2008). The rescue of regional culinary value and its adaptation to the contemporaneous reality make it possible to increase the demand of accessible and known products to the population and, with the appropriate dietary modifications, provide a healthier daily cuisine (Coitinho, Monteiro, & Popkin, 2002; Kinouchi, Diez-Garcia, Holanda, Zambianchi, & Roque, 2008).
Considering these facts, it is necessary to study techniques and procedures for the production/preparation of meals that fulfill the healthful requirements established by the World Health Organization/Food and Agriculture Organization (WHO/FAO, 2003) concerning the ingestion of fat without ignoring the sensorial satisfaction of the consumer (Jones, 2005). The present study aims to reduce the fat concentration of 10 traditional recipes from Brazil while maintaining their acceptability.

MATERIAL AND METHODS

Type of Study

This experimental study took an exploratory and quantitative approach and was subdivided into five steps: selection of recipes, preparation of recipes, determination of the chemical composition, sensorial analysis of the standard and modified preparations, and statistical analysis.

STEP 1: RECIPE SELECTION

The recipes were selected from a reference Brazilian culinary book by Mauro Fisberg, Wehba, & Cozzolino (2002) that includes recipes that are part of the feeding habits of the Brazilian population and are regularly consumed. Then the recipes were submitted to a nutritional composition analysis in order to identify the fat content (Núcleo de Estudos e Pesquisas em Alimentação, 2006). By means of previous analysis, it was observed that among 185 recipes regional preparations mentioned by Fisberg et al., 64% had fat content over 30%, which contradicts the WHO/FAO (2003) recommendations of healthy eating. Ten regional recipes with fat content above 30% were randomly selected in order to provide sweet (dessert) and salty (main course) preparations from all five of Brazil's regions (north, northeast, central west, southeast and south). The main factors for choosing the recipes were: high fat content, the possibility of modifying the cooking techniques, and the possibility of replacing the high fat ingredients for similar, healthy, regional ones. Recipes that could lose the original characteristics with the applied modifications were excluded because they would not satisfy the consumer population's expectations.

STEP 2: SAMPLE PREPARATION

The selected recipes were tapioca flan (pudim de tapioca) and banana pie (torta de banana) from the northern region; hominy porridge (mungunzá) and corn cake (bolo de milho verde) from the northeast region; goianian pie (empadão goiano; salty pie made with chicken, palm cabbage, pork, pork sausage, olives, eggs, and typically cheese from the region) and cassava cake (mané pelado) from the central west region; tropeiro beans (feijão tropeiro;
Reducing Fat Content

233

recipe prepared with beans, cassava flour, fried bacon, sausage, and pig fat) and spiced chicken with rice (galinhada) from the southeast region; and carreteiro rice (arroz carreteiro; single dish made with rice and jerk meat) and pork ribs with ground corn (quirera lapiana) from the southern region. The first step was to identify the origin of the high fat content. Then substitute ingredients were proposed based on the original product's functionality. When the origin of the high fat content was attributed to the cooking technique, techniques with similar principles using dry, humid, or mixed heat procedures were applied, and modified/substitute ingredients were selected according to the fat properties in the standard preparations (Figure 1; Conchillo, Ansorena, & Antiasaran, 2004; Weber, Bochi, Ribeiro, Victorio, & Emanuelli, 2008).

STEP 3: EXPERIMENTAL ANALYSIS

The analyses were performed in triplicate and the results reflect the average obtained. For the humidity the analytical rule of the Institute Adolph Lutz (1995) was chosen with direct heating of the sample in greenhouse at 105°C. For fixed mineral residue the method of incineration (ashes) at 550°C was applied according to the Association of Official Analytical Chemists (AOAC, 1998). Protein was determined by Kjeldahl's method (Hein, Jaeger, Carr, & Delahunty, 2008). The lipid fraction was analyzed by the continuous Soxhlet extraction (AOAC). Carbohydrate values were determined by difference, subtracting from 100 the values found for humidity, protein, lipids, and fixed mineral residue. The total energetic value was achieved by Atwater's factors.

<table>
<thead>
<tr>
<th>Fat properties</th>
<th>Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td>• Maillard reaction;</td>
</tr>
<tr>
<td>Color</td>
<td>• Caramellisation;</td>
</tr>
<tr>
<td>Brightness</td>
<td>• Cooking method;</td>
</tr>
<tr>
<td>Surface uniformity</td>
<td>• Raising protein and liquids.</td>
</tr>
<tr>
<td><strong>Texture</strong></td>
<td>• Protein, liquids, fibre, starch and gum.</td>
</tr>
<tr>
<td>Softness</td>
<td>• Cooking method.</td>
</tr>
<tr>
<td>Plasticity</td>
<td>• Protein coagulation.</td>
</tr>
<tr>
<td>Elasticity</td>
<td></td>
</tr>
<tr>
<td>Crispiness</td>
<td></td>
</tr>
<tr>
<td><strong>Taste</strong></td>
<td>• Cooking methods (flavor concentration)</td>
</tr>
</tbody>
</table>

**FIGURE 1** Fat properties and substitutes.
STEP 4: SENSORIAL ANALYSIS

To determine individuals' acceptance levels in relation to the preparations, sensorial tests of the samples were performed with students, employees, and visitors of the Center of Excellency in Tourism of the University of Brasilia. At least 50 individuals per sample were chosen randomly in the area. The study was previously approved by the ethics committee of the Heath Sciences Faculty of the University of Brasilia. The applied method for sensorial analysis was the quantitative affective type. This method identifies the affective status of individuals in relation to the modified and standard preparation by their sensorial characteristics without effective comparison between the samples (Hein et al., 2008). The individuals expressed their acceptance following a hedonic scale of 7 points (1 = disliked very much, 4 = neither liked/nor disliked, 7 = liked very much; Hein et al.). The acceptance of recipes was expressed as percentage of acceptance, indifference, and rejection. The sample was considered as having good acceptance when 70% or more of the individuals expressed values higher than 4 on the hedonic scale (Folley, Beckley, Ashman, & Moskowitz, 2009; Moraes, Pertuzatti, Correa, & Salas-Mellado, 2007).

STEP 5: STATISTICAL ANALYSIS

The sensorial tests results (expressed by means) were analyzed by F test, which determines whether the samples are significantly different with a reliable interval of 95%. The hypothesis H1 used for evaluation of the results was “The samples are differently accepted.” The acceptance of the hypothesis occurred when the p value was below 0.05 (Martines, Bisquerra, & Sarierra, 2004).

RESULTS AND DISCUSSION

Average lipid reduction for the modified samples was approximately 61.5% for salty preparations and 91.5% for the sweet ones. In general, in order to reduce the lipid content of the preparations the main strategies adopted were substitution of high-fat ingredients for lean, healthy ones and/or elimination of apparent fat (in the case of meat products) and alteration of the cooking methods applied.

Several studies point to the relevance of the role of lipid molecules in the development of substances responsible for flavor by means of reactions of decomposition, hydrolysis, oxidation, or enzymatic nature (Rahman, Al-Belushi, Guizani, Al-Saidi, & Soussi, 2008). As observed in Table 1, the modifications resulted in a total fat reduction without significantly altering food acceptance. Traditional or modified samples were equally accepted by the subjects, with the exception of carreteiro rice and banana pie. Although
TABLE 1 Acceptance and lipid reduction in regional preparations for the standard (S) and modified (M) samples

<table>
<thead>
<tr>
<th></th>
<th>Lipid reduction (%)</th>
<th>Acceptance average</th>
<th>Acceptanceb (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
<td>M</td>
<td>P valuea</td>
</tr>
<tr>
<td>Salty preparations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goianian pie</td>
<td>24.0</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>Tropeiro beans</td>
<td>55.6</td>
<td>5.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Ground corn with pork</td>
<td>48.6</td>
<td>4.7</td>
<td>4.3</td>
</tr>
<tr>
<td>ribs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carreteiro rice</td>
<td>90.6</td>
<td>5.3</td>
<td>5.5</td>
</tr>
<tr>
<td>Chicken with rice</td>
<td>88.7</td>
<td>5.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Sweet Preparations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hominy porridge</td>
<td>98.0</td>
<td>4.9</td>
<td>5.3</td>
</tr>
<tr>
<td>“Tapioca” flan</td>
<td>90.7</td>
<td>6.1</td>
<td>5.7</td>
</tr>
<tr>
<td>Cassava cake</td>
<td>83.0</td>
<td>5.2</td>
<td>5.1</td>
</tr>
<tr>
<td>Corn cake</td>
<td>97.0</td>
<td>5.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Banana pie</td>
<td>88.0</td>
<td>5.9</td>
<td>5.4</td>
</tr>
</tbody>
</table>

*a* P ≤ 0.05.

*b* Numbers are the mean results from the hedonic evaluation. A 7-point scale was used; value >5 indicate acceptance.

the goal was to maintain the acceptance, the modified sample of carreterio rice had better acceptance than the traditional one.

Salty Preparations

To reduce the concentration of lipids in the goianian pie fillings, apparent meat fat was eliminated and the olive oil content was minimized by 75%. Substitution of pork sausage for chicken sausage reduced the lipid content by 40.0%. Grated chayote was added to the filling of the modified sample in order to compensate for the volume lost promoted by the substitution of the original ingredients. In the modified sample, chicken breast was cooked in humid heat for 30 minutes and the sausage was grilled (200°C) for 25 minutes, discarding the excess fat. The original ingredients of the standard sample were fried (Danowska-Oziewicz, Karpiska-Tymoszczyk, & Borowski, 2007). The preference for the technique used in the preparation of the sausage was due to the similarity of the final product in relation to the sensorial characteristics obtained in the fried process and the possibility to eliminate oil during the process. The methods that use dry heat are described as concentrated methods; they create an external layer that dehydrates it with the heat, providing an attractive color to the food and characteristic flavor (Freeland-Graves & Peckham, 1995).

For pastry, oat flour was added in order to increase the fiber content in the preparation. Fiber is recognized as important in the prevention of noncommunicable diseases, such as diabetes, hypertension, and cancer.
(Anderson et al., 2009). Yet, maize starch addition resulted in a product with sensorial characteristics differentiated by its lightness, as a consequence of the solvent, dispersant, and hydrated action of water molecules. Other pastry ingredients considered as lipid sources were reduced in the modified recipe. Whole milk, eggs, butter, and pig fat were replaced by skim milk and mayonnaise, thus preserving the emulsifying properties of the egg (Mine, 2002).

For *tropeiro* beans, fried pork sausage was also substituted by grilled chicken sausage; the fried lard was reduced by 50.0% without oil addition. The excess fat released from lard was discarded. To improve the volume and fiber content both cabbage and beans (also present in the original recipe) were increased by 5%. The addition of cabbage and the reduction of lard with the discard of excess fat improved the sensorial attributes of the preparation. These attributes ensure the acceptance of food products, and this may have corroborated on the final results (Rapp et al., 2009).

For the modified ground corn with pork ribs, the pork ribs were partially substituted by lean bovine meat (bovine muscle), with 44% less fat, and the amount of oil was reduced by 83%. Pork ribs and lean bovine meat were baked instead of fried as in the original samples. The presence of fat and a small amount of connective tissue in the pork rib favors its sensorial evaluation in relation to the bovine muscle. In order to compensate for the texture characteristics of the modified sample, pineapple bromelain added. The meat was marinated in sequence to promote protein hydration. The presence of the pineapple bromelain promotes hydrolysis of myofibril proteins, resulting in increased meat softening by the collagenolytic activity of the enzyme (Bille, 2009).

Both standard and modified samples hadn’t achieved the acceptance level of 70%, meaning that both weren’t well accepted. That could be explained by the lack of familiarity with the preparation, as it is typically consumed in the south of Brazil (Folley et al., 2009).

To reduce the concentration of lipids in the carreteiro rice preparation, part of the jerked beef selected had a lower concentration of apparent fat that was totally removed in a subsequent step. Also, the amount of jerked beef used in the sample was reduced by 50.0% and the fat used for braising the meat and rice was reduced by 85% compared to the standard preparations. The meat was boiled for 3 minutes and the process was repeated three times. This technique has impact on lipid content, mainly on cholesterol, although it is mostly used for desalting processes (Cobos, Veiga, & Díaz, 2004, 2008). The modifications resulted in approximately 91% lipid reduction and better percentage of acceptance that those for standard samples as shown in Table 1.

The modified preparation of chicken with rice (galinhada) was submitted to similar changes as those used in preparing ground corn with pork ribs. Baking instead of frying skinless chicken breast (in place of the whole chicken used in the standard preparation) results in 51.4% less fat in
Reducing Fat Content

Reducing Fat Content (Núcleo de Estudos e Pesquisas em Alimentação, 2006). Chicken fat is mainly located under the skin, thus facilitating its removal. Chicken meat, specifically with reduced fat content, seems to dehydrate easier. Cooking methods applying humid heat or mixed heat (dry and humid) better preserves the meat humidity and flavor (Wattanachant, Benjakul, & Ledward, 2005). Another relevant factor that contributes to the sensorial quality of this preparation is the marinating technique applied in order to confer softness, humidity, tenderness, and particular flavors to meat, poultry, and fish (Sheard & Tali, 2004). The average acceptance of the modified and standard samples of the chicken with rice confirms the viability of the discussed techniques (Table 1).

Sweet Preparations

In Brazilian traditional culinary, the fat content of sweet preparations is generally less affected by cooking methods (there are few fried sweet preparations). The main modification applied to these preparations is the removal/substitution of fat products that confer similar characteristics. To reduce the lipid content of hominy porridge (mungunzá), coconut milk was substituted with skim milk, skim milk powder, and grated coconut. The analysis demonstrates that the modified sample had 14.2% fewer calories, with a fat reduction of 98.0% (Table 1). In addition, the modified sample had 0.7% of total fat, which enables its consumption by patients with lipid restriction. The acceptance rate of the modified preparation showed no significant difference (p = 0.031) in relation to the standard one.

The alterations for the modified sample of tapioca flan provided a lipid reduction of over 90% (Table 1). Condensed milk (evaporated milk with addition of 40% of sugar) and butter were removed; whole milk was substituted by skim milk; the amounts of grated coconut and eggs yolk were reduced; and powdered milk and refined sugar were added, once the objective of the lipid reduction was achieved, without interfering with the amount of sugar present in the recipe. The use of skim milk and milk powder, also fat free, increased the amount of protein present, contributing to the properties of solubility, viscosity, and cohesion. Particularly, the milk powder was used to nutritionally enrich the preparation, without raising the amount of liquid used, providing a golden formation on the top of the final product (Maillard’s reaction) and contributing to the preparation’s firmness (Gonzáles, Naranjo, Leiva, & Malec, 2009).

The total exclusion of the egg yolk was not viable, because the proteins present in the egg act as an emulsifier, holding back water and conferring thickness to the mixture and the maintenance of the preparation’s shape and texture (Kiosseoglou, 2003). The gel texture provided by the tapioca starch makes the egg yolk reduction possible.

The egg white content was maintained in order to develop surface properties such as cohesion, foam formation, and film formation; in addition, the
whisked egg white confers lightness to the product (Wang & Wang, 2009). The statistical data (Table 1) show that the acceptance rate of the modified tapioca flan was not significantly different from the standard sample ($p = 0.14$).

In order to reduce the lipid content from the cassava cake sample (*mané pelado*), the white cheese was substituted by ricotta cheese, which contains approximately 17% less lipids; butter was totally removed and replaced by skim milk and skim milk powder; and grated coconut and egg yolks were reduced by 50%. The substitution of these ingredients made the modified sample less soft than the standard recipe (Perry, Swanson, Lyon, & Savage, 2003). However, the use of whipping eggs and milk, to humidify the pastry among other ingredients, contributed to the formation of a product with satisfactory texture, aspect and flavor providing a positive evaluation to the modified sample, meaning both preparations were equally accepted. Softness losses in the modified sample were compensated for by the addition of whipped eggs and milk. For the corn cake (*bolo de milho verde*) samples, the same strategies applied for cassava cake were adopted, although strategies for enhancing the corn flavor such as increasing corn content (34%) were needed. Texture and tenderness of the modified samples were compensated for by the aeration property of the whipped eggs and by the formation of a cream with milk and maize starch (Lucca & Tepper, 1994).

For the banana pie (*torta de banana*) modified sample, distinct cooking techniques were adopted, in addition to ingredient substitution. Banana slices were cooked in water (in the original recipe they were fried); butter used for the cream was eliminated, and egg yolk was reduced by approximately 67% of content of the standard recipe. These modifications made it possible to reduce lipid content by about 88% (Table 1). The standard and modified samples of the *torta de banana* presented similar sensorial characteristics, with regard to superficial aspects and flavor. Humidity and color of the banana present in the standard recipe were not preserved in the modified one. In order to compensate for this, a cream made of liquid and powdered skim milk was added. These modifications, however, were insufficient for maintaining a similar acceptance level between the standard and modified banana pie samples ($p = 0.04$). That was the only modified sweet preparation that had inferior acceptance compared to the standard.

The average acceptance rates obtained for standard and modified samples of the salty and sweet preparations indicate approval of the reduction and/or substitution of lipid ingredients and techniques of cooking. With the exception of the standard and modified samples of ground corn with ribs and the standard sample of corn cake, all the samples obtained percentage of acceptance superior or equal to 70%, thus characterizing the product’s approval (Folley et al., 2009).

Products that are not acceptable in terms of palatability or appearance, regardless of the health characteristics attributed to them, will not be recognized by individuals, so maintaining product’s characterization is
Reducing Fat Content

fundamental for developing healthier food products (Colmenero, 2000). Although individuals tend to prefer full-fat foods over low-fat ones for their sensorial and technologic characteristics (Rapp et al., 2009), it is possible to achieve high acceptance rates for low-fat regional preparations compared to standard ones when the right techniques and ingredients modifications are applied.

CONCLUSIONS

Regional preparations are part of the habitual diet of individuals. However, in order to develop healthier consumption habits, many health care professionals recommend the replacement of these products for industrialized low-fat ones. This attitude promotes low adherence to prescribed diets and in long-term loss of cultural habits. This article shows that fat reduction does not alter regional food acceptance when the right technique and ingredient modifications are applied. Thus, regional food modification represents a new approach to approximate cultural and health habits favoring life quality. More studies are needed to demonstrate this among other regional cuisine.

REFERENCES


Food and Agriculture Organization. (2005). *Voluntary guidelines to support the progressive realization of the right to adequate food in the context of national food security*. Rome, Italy: Author.


