



## Labeling of pickled vegetable products produced by agroindustries: compliance analysis based on the Brazilian legislation

Priscila Endlich LOZER<sup>1</sup> , Denes Kaic Alves ROSÁRIO<sup>2</sup> , Jackline Freitas Brilhante de SÃO JOSÉ<sup>1,3\*</sup> 

### Abstract

Labeling is an important tool used to provide consumers with information about food products in compliance with health regulations. The aim of this study was to investigate the compliance of labels associated with pickled vegetable products produced by rural family agroindustries in the Serrana Region, Espírito Santo State, Brazil, with the Brazilian sanitary surveillance legislation. Secondary data from the State Food Monitoring Program developed by Espírito Santo State's sanitary surveillance agency were herein used. Collected data were systematized into a legislation-based checklist comprising 108 items that were divided into 8 blocks, namely, General principles, Language, Mandatory information, Mandatory information presentation and distribution, Voluntary labeling, Gluten, Allergens, and Nutritional labeling of packaged foods. The results were analyzed through descriptive statistics, multivariate data analysis based on the Ward method, and non-hierarchical data analysis based on the K-means method. The minimum and maximum adequacy rates reached 23.1% and 94.3%, respectively, and the mean adequacy rate was 57.1%. The highest non-compliance mean values were linked to nutritional labeling (66.4%), gluten-incidence indication (55.2%), voluntary labeling (56.0%), and mandatory information presentation and distribution (42.8%). All product labels were classified as non-compliant; therefore, the health legislation was not met.

**Keywords:** food labeling; nutrition labeling; legislation; product safety.

**Practical application:** Irregularities found on labels can contribute to prioritize actions taken by the government.

### INTRODUCTION

Pickling is a processing strategy used to prolong vegetables' preservation time (Cantelli et al., 2020), as well as to avoid waste, extend post-harvest consumption time, use agricultural production surpluses, and add value to products (SENAR, 2017; Vinha & Dias, 2019). These products must be manufactured in compliance with good manufacturing practices (Furtado & Silva, 2005; Krolow, 2006; Torrezan et al., 2017), and the finished product must be labeled in compliance with food labeling standards (Brasil, 2003a).

The National Health Surveillance Agency, which is also known as ANVISA, regulates food labeling in Brazil and defines labeling as "any inscription, caption, image or any descriptive or graphic material written, printed, stamped, engraved, embossed or lithographed or pasted on food packaging" (Brasil, 2022a, p. 213). Food labels must have legible characters (Brasil, 1969), written in the official consumption language, at proper size and emphasis, without prejudice to contents written in other languages (Brasil, 2022a). This set of information cannot mislead consumers about the nature, features, quality, quantity, properties, origin, composition, validity, yield, or form of using the product (Brasil, 1990; 2022a).

Labeling is an important tool used to provide information about food products to consumers who seek information on quality dimensions other than flavor and appearance, namely, product healthiness, origin, ingredients, storage and use instructions, batch, and content, among others (Meijer et al., 2021). These dimensions can influence the purchase of healthier food products (Ni Mhurchu et al., 2018).

Despite the role played by the food labeling health legislation in ensuring the population's health and consumers' access to quality information (Santana et al., 2018), several labels present unsatisfactory information, as well as incorrect data capable of misleading consumers to buy food products with nutritional content different from the one stated on their label or products lacking information about allergens, whenever applicable (Sousa et al., 2020). Non-compliance with food labeling health regulations was observed in several studies (Boscardin et al., 2020; Cunha et al., 2020; Mattar et al., 2022; Morais et al., 2014; Sanches & Souza, 2020; Silva et al., 2017; Soares & Nunes, 2021).

Rural family agroindustry presented a hard time meeting sanitary standards set for food labeling processes. They often work with small-scale food production based on family labor and the application of their own artisanal processes (Freitas

Received June 10, 2022.

Accepted Sept. 13, 2023.

<sup>1</sup>Universidade Federal do Espírito Santo, Nutrition and Health Postgraduate Program, Vitória, ES, Brazil.

<sup>2</sup>Universidade Federal do Espírito Santo, Department of Food Engineering, Alegre, ES, Brazil.

<sup>3</sup>Universidade Federal do Espírito Santo, Integrated Health Education Department, Vitória, ES, Brazil.

\*Corresponding author: jackline.jose@ufes.br

et al., 2023). They do not have specialized professionals to make product labels. Labels in these ventures are often empirically prepared or are based on similar products available in the market. Moreover, products are often traded without labels or with inadequate labeling (Freitas et al., 2017). Thus, assumingly, pickled vegetables produced by rural family agroindustries in the mountainous region of Espírito Santo State (ES) present non-conformities on their labels, and this issue can impair the proper selection of food products, products' traceability, and consumers' access to proper, clear, and correct information, as well as poses risks to consumers' health. Thus, the aim of this study was to investigate the compliance of labels—associated with pickled vegetables produced by rural family agroindustries in the mountainous region of Espírito Santo—with the Brazilian health legislation.

## 2 MATERIALS AND METHODS

### 2.1 Study type and data collection

This is a descriptive, observational, and cross-sectional study based on secondary monitoring data about food products collected in Espírito Santo State, Brazil, between June and September 2022, as part of the State Food Monitoring Program—also known as PROALI—which was developed by the sanitary surveillance of the aforementioned state.

Data comprising sample collection date, product name, brand, producer, manufacturing date, expiration date, batch, package content, and manufacturer's information (name and full address) were extracted from sample collection terms; analyses were requested; labeling assessment data were extracted from analysis reports; and photos of product labels were used to check conformity in the label of each pickled vegetable sample.

Inclusion criteria comprised all data about pickled vegetables monitored by PROALI from June to September 2022, immersed in covering liquid, acidified (either artificially or by fermentation), naturally acidic or marinated, and manufactured by rural family agroindustries located in the mountainous region of Espírito Santo State. The aforementioned region comprises 11 municipalities, namely, Afonso Cláudio, Alfredo

Chaves, Castelo, Conceição do Castelo, Domingos Martins, Marechal Floriano, Santa Leopoldina, Santa Maria de Jetibá, Santa Teresa, Vargem Alta, and Venda Nova do Imigrante. This region was selected because it is the place in Espírito Santo State where agritourism and family agroindustries emerged (Frade et al., 2016).

Samples presenting animal-origin ingredients in their composition were excluded from the study, as well as samples showing manufacturing dates after September 1, 2022, when the new packaged food labeling legislation was enacted, RDC n. 727/2022 (Brasil, 2022a).

### 2.2 Data collection instrument

A data extraction and systematization checklist was prepared to check conformity in pickled vegetables' labeling. It was built based on the requirements provided by the legislation, as described in Chart 1. It comprised 108 assessment items that were divided into 8 blocks of items, namely, General principles (11 items); Language (1 item); Mandatory information (7 items); Mandatory information presentation and distribution (37 items); Optional labeling (4 items); Gluten (1 item); Allergens (10 items); and Nutritional labeling of packaged foods (37 items). Each item comprised three possible answers: “Yes (Y)”—when the item was mentioned on the label and complied with the legislation, “No (N)”—when the item was not mentioned on the label or did not comply with the legislation, either in full or in parts; and “Not Applicable (NA)”—when the item was not appropriate for the assessed product.

### 2.3 Statistical analysis

Data collected from each sample were tabulated in a Microsoft Excel® 2019 spreadsheet and subjected to descriptive statistical analysis. The compliance rate was calculated based on the Equation 1:

$$\text{compliance rate} = \frac{\text{total number of conforming items}}{(\text{total number of items} - \text{non-applicable items})} \times 100 \quad (1)$$

Multivariate analysis based on the hierarchical clustering method (or cluster analysis) was used to investigate the

**Chart 1.** Food labeling legislation used to check compliance of pickled vegetables' labels with the legislation, 2022.

Legislation	Description
Decree-Law n. 986, from 10/21/1969	It establishes basic standards for food (Brasil, 1969).
RDC resolution n. 259, from 09/20/2002	Technical regulation on packaged food labeling (Brasil, 2002).
RDC resolution n. 359, from 12/23/2003	Technical regulation on packaged food portions for nutrition labeling purposes (Brasil, 2003b).
RDC resolution n. 360, from 12/23/2003	Technical regulation on the nutritional labeling of packaged food products (Brasil, 2003c).
Law n. 10.674, from 05/16/2003	It requires traded food products to provide information about the presence of gluten in them, as celiac disease preventive and control measures (Brasil, 2003d).
RDC resolution n. 272, from 09/22/2005	Technical regulation focused on vegetable and fruit products and on edible mushrooms (Brasil, 2005).
RDC resolution n. 54, from 11/12/2012	It provides the technical regulation of complementary nutritional information (Brasil, 2012).
RDC resolution n. 8, from 03/06/2013	It provides the approval to use food additives in fruit and vegetable products and in <i>mocotó</i> (calf's foot) jelly (Brasil, 2013).
RDC resolution n. 26, from 07/02/2015	It provides requirements for the mandatory labeling of the main food products capable of causing food allergies (Brasil, 2015).
Inmetro ordinance n. 249, from 06/09/2021	It approves the consolidated Metrological Technical Regulation accounting for establishing the way of expressing the quantitative indication of liquid content in pre-packaged goods (Brasil, 2021).

association between categories of the investigated pickled vegetables and the analyzed data. It was done based on the Ward method with Euclidean distance. Pickled vegetables' categories and the number of non-conformities were analyzed based on similarity or distinction degree, and data were used to build a dendrogram. Subsequently, non-hierarchical K-means analysis (K-means method) was used to confirm categories' clustering and their association with the number of non-conformities. Results were graphically expressed. The OriginPro software, version 2017, was used for the aforementioned analyses (OriginLab, EUA).

## 2.4 Ethical aspects

This research was submitted to the Research Ethics Committee (CEP) of the Health Sciences Center of the Universidade Federal do Espírito Santo (UFES), in compliance with guidelines established by the National Health Council Resolution n. 466/2012 (Conselho Nacional de Saúde, 2012). It was approved under CAEE n. 66175522.5.0000.5060 and n. 5.895.875. The *Instituto Capixaba de Ensino, Pesquisa e Inovação em Saúde* (ICEPI) has authorized secondary data collection in the State Health Surveillance of the Health Secretariat of Espírito Santo State. All information composing the sample was kept under wraps.

## 3 RESULTS AND DISCUSSION

### 3.1 Overall pickled vegetables' labeling assessment

Information available in the sample collection terms, analysis reports, and pictures of 59 samples of pickled vegetables monitored by the program were assessed. One sample was excluded because it did not meet the criterion of "being manufactured by rural family agroindustry located in the mountainous region of Espírito Santo State." In total, 58 samples were selected; they were produced by 37 rural family agroindustries (producers). The herein assessed pickled vegetable samples were distributed into five categories, namely, *antipasto/caponata* 20.7% ( $n = 12$ ), pickled mushroom 15.5% ( $n = 9$ ), vegetable pickles 27.6% ( $n = 16$ ), pickled pepper 22.4% ( $n = 13$ ), and dried tomato/confit 13.8% ( $n = 8$ ) (Table 1).

Non-compliance with food labeling legislation requirements was also observed in other studies focused on assessing

analysis reports of different pickled food types (vegetables, mushrooms, and fruits) monitored by a food-monitoring program. Almeida (2015) assessed analysis reports on pickled vegetables and mushrooms and found that 45.7% ( $n = 21$ ) of the 46 analyzed samples recorded unsatisfactory labeling results. According to Vieira (2014), 38.7% ( $n = 12$ ) of the 31 analyzed pickled vegetable samples recorded unsatisfactory labeling results. Ferreira and Machado (2018), in their turn, observed that 100% ( $n = 25$ ) of reports on fruit derivatives, such as fruit in syrup, jelly, and fruit pulp, recorded unsatisfactory labeling results.

All (100%;  $n = 58$ ) assessed samples presented, at least, one non-compliance in their label. Samples' total conformity to 108 items assessed in the checklist ranged from 23.1% ( $n = 1$ ) to 94.3% ( $n = 2$ ), and the mean conformity rate reached 57.1%.

### 3.2 Assessing pickled vegetables' labeling based on item blocks

According to the assessment based on item blocks, analyzed labels overall recorded the highest conforming item rates in Blocks 1 (General principles) and 2 (Language). The lowest compliance rates were observed in Blocks 5 (Voluntary labeling), 6 (Gluten), and 8 (Nutritional labeling of packaged foods). Pickled mushrooms were the category recording the highest mean conforming-item rate (77.1%) among the herein analyzed five product categories. Pickled pepper, in turn, was the category recording the lowest mean conforming-item rate (44.2%) (Figure 1).

#### 3.2.1 Block 1: General principles

The mean value equal to 94.7% was observed for conformity with general principles. Among non-conformities, 34.5% ( $n = 20$ ) of samples presented graphic representations or information capable of inducing consumers to a misconception, error, confusion, or mistake, namely, pictures of vegetables that were not part of the product's ingredients list, picture of the Italian flag, mention to wrong or altered legislation about exemption from registration, and pen-made cross-outs on the list of ingredients (strikethrough words or words ambiguously written in pen). These factors violate consumers' rights as they must have access to appropriate and clear information about the products to be purchased, as well as to correct specifications about their features, composition, and quality (Brasil, 1990).

**Table 1.** Distribution of samples of pickled vegetables produced by rural family agroindustries, in the mountainous region of Espírito Santo State, Brazil, based on category, producer, and type, 2022.

Category	Producer* (n)	Type	Total number of samples n (%)
<i>Antipasto/Caponata</i>	10	Leek, eggplant, zucchini, vegetables, and mushroom	12 (20.7)
Pickled mushroom (whole and sliced)	6	Paris mushroom	9 (15.5)
Vegetable pickles	13	Mixed, potato, <i>jurubeba</i> , garlic, and tomato with garlic	16 (27.6)
Pickled pepper	13	Brazilian sweet, red, chili, and black pepper	13 (22.4)
Dried tomato/confit	8	Tomato	8 (13.8)
<b>TOTAL</b>	<b>50</b>		<b>58 (100)</b>

\*A single producer can produce different pickled food types.

3.2.2 Block 2: Language

All samples recorded total compliance with language: they were all written in Portuguese, as products selected for this study were manufactured in Espírito Santo State, Brazil. In addition, agribusiness products are not intended for international markets; they are traded in the agribusiness sector itself, or in free fairs, cooperatives, intermediates, retail, wholesale, and institutional markets (Prezzoto, 2016), and governmental programs (Frade et al., 2016).

3.2.3 Block 3: Mandatory information

Mean compliance with mandatory information observed for the assessed samples reached 78.0%, and 69.0% ( $n = 40$ ) of the analyzed samples did not provide all the required mandatory information. With respect to non-compliance with this block, there was lack of information such as food sales denomination (1.7%;  $n = 1$ ), ingredients list (15.5%;  $n = 9$ ), liquid content (41.4%;  $n = 24$ ), origin identification (50.0%;  $n = 29$ ), batch identification

(13.8%;  $n = 8$ ), expiration date (8.6%;  $n = 5$ ), and instructions on food preparation and use (33.3%;  $n = 2$ ). A different finding was reported in the study conducted by Santana et al. (2018) with 33 pickled cucumber samples: all assessed labels were in compliance with the current legislation on general labeling and a quantitative indication of liquid content and drained weight.

Mandatory information should be included in all traded food products packed in the absence of customers—regardless of their origin—and ready to be supplied to consumers (Brasil, 2002).

3.2.4 Block 4: Mandatory information presentation and distribution

Mean compliance with the mandatory information presentation and distribution block reached 57.2% among the assessed samples. None of the herein assessed sample labels had all mandatory information presented and distributed in compliance with the legislation. The main non-conformities observed in this block are described in Chart 2.

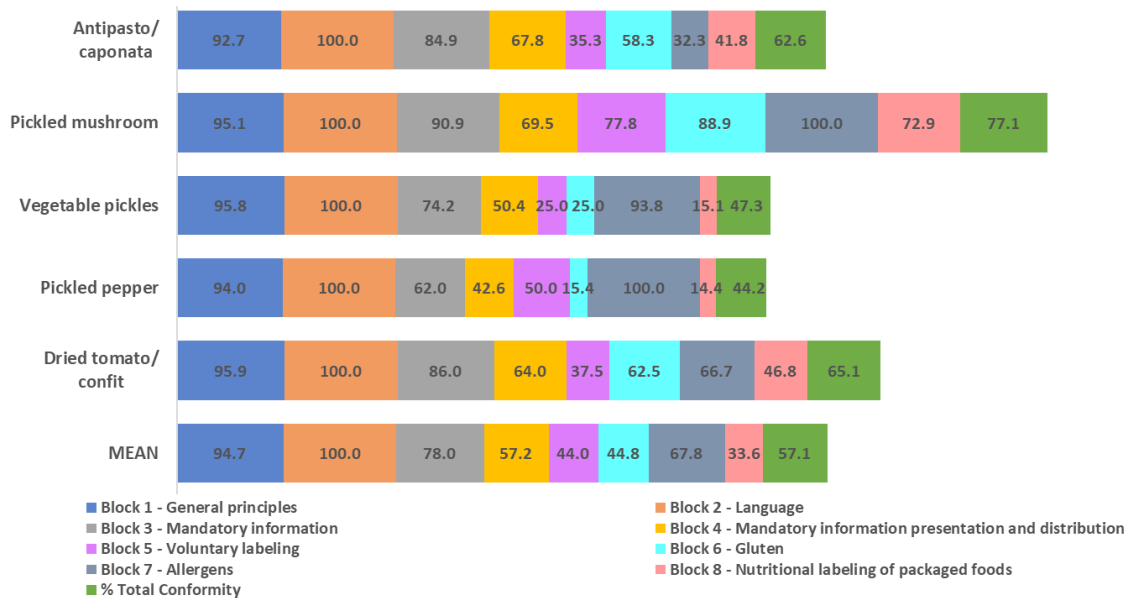


Figure 1. Mean rate of sample conformity recorded for 108 items in the checklist, based on product category and blocks, 2022.

Chart 2. Main non-conformities observed in Block 4—Mandatory information presentation and distribution.

Mandatory information presentation and distribution	Non-conformity	%(n)
Sales denomination	Non-compliance with specific technical regulations.	37.9 (22)
Ingredients list	Ingredients were not presented on a list preceded by one of the following expressions: “ingredients” or “ingr.”	48.3 (28)
Declaration of Additives in the Ingredients List	Non-declared additives with main function, full name or INS (International Numbering System, Codex Alimentarius FAO/WHO), or both, when it comes to the ingredients list.	19.0 (11)
Liquid content	The adopted unit was not in compliance with products’ measurement type (quantity) and liquid volume.	55.2 (32)
	Expression preceding the quantitative indication was not in compliance with the traded product.	70.7 (41)
Origin identification	Lack of full address, including country of origin, and use of expressions such as “manufactured in ...,” “product ...,” or “industry ...”	67.7 (39)
Batch identification	Batch was not indicated by code preceded by letter “L” or by the manufacture, packaging, or expiration date to indicate, at least, the day and month and the year.	15.5 (9)
Expiration date	Product’s expiration date was not properly presented: at least, month/year expressed in non-coded numeric order for products with expiration date exceeding 3 months.	67.2 (39)
	Lack of indications about the necessary precautions to be taken after the packaging is open.	100 (58)

Plant products must be named based on their use and followed by an expression referring to the ingredients featuring these products. Mushrooms, for example, must be called mushrooms and followed by their scientific name or species. These denominations can be followed by expressions associated with the manufacturing process and/or presentation form, or by specific features of the product (Brasil, 2005). In addition to products' designation, mandatory information, such as origin, manufacturing date, expiration date, and batch number, is essential to assure products' traceability and recall actions (Brasil, 2022b). It also enables health surveillance to adopt appropriate sanitary measures in food-producing establishments whenever deviations in their products are observed.

Expiration date is one of the information most influencing food purchase (Sousa et al., 2020). This information, in association with storage instructions, helps prevent food deterioration (Meijer et al., 2021). Expiration date must be determined by food manufacturers, based on documented justification of how it was established, be it through technical evaluations, stability studies, and laboratory test reports used to substantiate such a determination (Brasil, 2018). However, the aforementioned technical evaluations are quite complex, as they require in-depth technical knowledge and affect production costs. It can be a hindrance for food producers in agroindustries whose main features comprise being located in rural areas, mainly using family labor and producing at small scale (Cruz, 2020).

Ingredients list is another mandatory information to be presented on the label as it helps consumers to identify products' composition. Moreover, it is seen by consumers as one of the most important pieces of information, after calories (Sousa et al., 2020). The lack of this information makes it hard for consumers to better understand the nutritional quality of food products and select the most suitable and healthiest ones (Pereira et al., 2019). In addition, it enables the identification of ingredients, such as food additives and modified fats, which can cause health issues such as allergies and chronic low-grade inflammation that can lead to obesity and metabolic syndrome (Mattar et al., 2022).

### 3.2.5 Block 5: Voluntary labeling

Items associated with voluntary labeling recorded 44.0% conformity in the assessed samples, on average. The main non-conformities identified in this block comprised samples denominated as homemade and/or artisanal, and/or without preservatives, and/or "flavor with taste of tradition" (29.3%;  $n = 17$ ).

The term "homemade" is often used for products with unique features. It refers to features of food items prepared at home, which are not found in industrialized food products. Moreover, it has been used to attract consumers based on their affective memories. The term "artisanal" is used for food products that, in theory, are manually prepared (Machado et al., 2018). This information can mislead consumers as to the true nature of these products (Brasil, 2002). The term "without preservatives" highlights specific food composition features and leads consumers to believe that a given product has a superior quality; this factor contradicts voluntary labeling items 7.2.1

and 7.2.2 of RDC resolution n. 259/02, which forbids using quality designations that are not addressed in specific technical regulations (Brasil, 2016). With respect to the term "flavor with a taste of tradition," the indication of "... flavor" or "imitation or artificial ... flavor" can only be used on labels of food products prepared with natural or artificial essences, respectively (Brasil, 1969). Thus, the use of these terms has no legal provision in Brazil, and therefore, they cannot be used on food labels.

### 3.2.6 Block 6: Gluten

Conformity associated with information about gluten reached 44.8% among the assessed samples, on average. Notably, 32 ( $n = 32$ ; 55.2%) of the analyzed samples did not present warnings, such as "Contains Gluten" or "Gluten-free."

According to Law n. 10.674/2003, traded food products must inform consumers about the presence of gluten in them, as a celiac disease preventive and control measure. Thus, labels must carry warnings such as "Contains Gluten" or "Gluten-free," written in prominent, clear, and easy-to-read characters (Brasil, 2003d). The lack of this information can pose risks to the health of individuals with celiac disease—whose treatment consists in fully excluding gluten from their diet—and lead to symptoms' recurrence due to inadvertent intake of these products. This factor emphasizes the importance of having reliable food labels comprising clear, accurate, and legible information to enable consumers to purchase food based on their peculiarities and needs (Morais et al., 2014).

### 3.2.7 Block 7: Allergens

Conformity with this block reached 67.8% among the assessed samples, on average. Among the observed non-conformities, 6.9% ( $n = 4$ ) of labels did not inform about the presence of allergen derivative in the products, such as nuts, almonds, or chestnuts, which are ingredients capable of causing food allergies. It is worth emphasizing that this rate may be higher if one takes into consideration that 15.6% ( $n = 9$ ) of evaluated samples did not have an ingredients list. Another non-compliance observed in the assessed labels was the fact that some products declared oil addition to the ingredients list, but they did not specify the type of oil that was used. Thus, if they used soy oil, it would not be declared in the ingredients list as an allergen derivative. In addition, it should be noticed that 5.2% ( $n = 3$ ) of products declared lack of food allergens, and it violates Art. 9 of RDC n. 26/2015, which prohibits this claim (Brasil, 2015).

Cunha et al. (2020) analyzed 35 food categories from a monitoring program and observed that 31.4% ( $n = 119$ ) of products presented some type of non-compliance with mandatory labeling requirements of the main allergy-causing food products. It is essential to provide proper information about allergens on food labels to help consumers with allergies and intolerance to certain food types or ingredients to avoid discomfort, illness, and even death (Meijer et al., 2021). Providing information about allergens is a tool used to help manage the risk of adverse clinical manifestations and protect human health, as restricting consumption is the only alternative available to prevent the onset of clinical complications (Brasil, 2017).

3.2.8 Block 8: Nutritional labeling of packaged foods

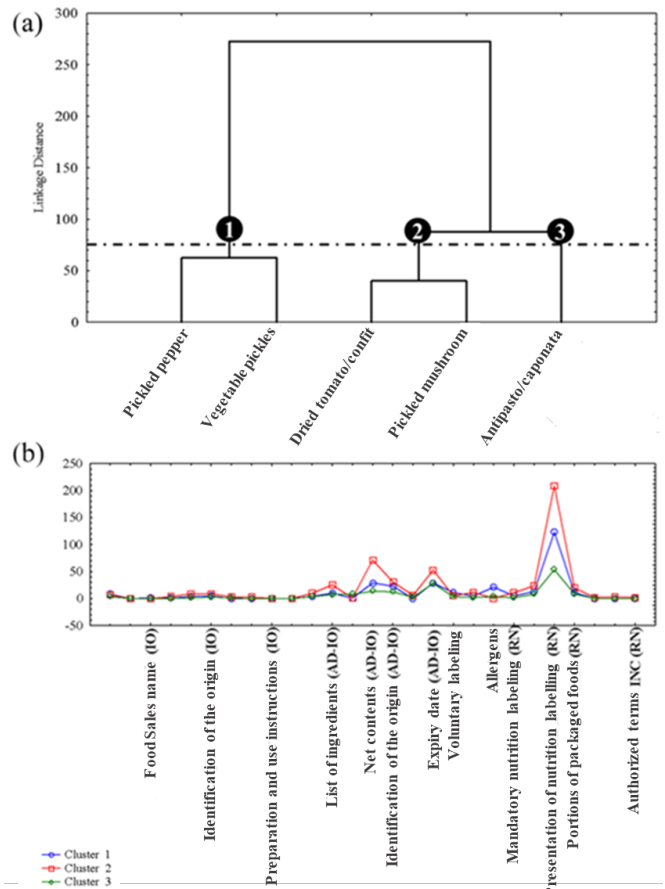
Conformity with nutritional labeling of packaged foods reached 33.6% among the assessed samples, on average. The main non-conformities observed in this block are described in Chart 3.

Nutritional labeling on packaged food labels is mandatory in Brazil, which includes the declaration of energy value and nutrients such as carbohydrates, proteins, total fats, saturated fats, trans fats, and sodium, as well as the voluntary declaration of complementary nutritional information (Brasil, 2003c). Products must also provide information about portions, which correspond to the average amount of food to be consumed by healthy individuals in order to promote a healthy diet. The serving size of pickled vegetables ranges from 15 to 130 g, depending on the pickled product type (Brasil, 2003b).

Nutritional information enables consumers to have access to information about the nutritional properties, energy value, and nutritional composition of the purchased food, as well as to exercise their right to choose at food-purchasing time. Individuals who use nutritional information for any purpose want to be aware of what they buy and consume in order to promote their health care (Sousa et al., 2020). Depriving consumers of this information is a worrisome practice, mainly in individuals whose health issues require restricting specific food types or nutrients and whose inadvertent intake can lead to health-related risks (Mattar et al., 2022). Therefore, it is worth emphasizing both the relevance and the need to comply with the health legislation.

3.3 Multivariate analysis

Hierarchical clustering was herein used to establish similarity between pickled vegetable category types and the number of non-conformities observed in product labels, based on the Ward method with Euclidean distance, which was used to generate a dendrogram (Figure 2a). To do so, three clusters were formed based on the cut made at the longest distance between groups. The analysis considered all the assessed items; it grouped the



IO: mandatory information; AD-IO: mandatory information presentation and distribution; RN: nutritional labeling of packaged foods; INC: complementary nutritional information.

Figure 2. (a) Dendrogram comprising food categories based on the number of non-conformities, by following Ward’s hierarchical method with Euclidean distance. (b) Graph showing standardized means recorded for items assessed based on the number of non-conformities, by following the non-hierarchical k-means method. Cluster 1: antipasto/caponata. Cluster 2: vegetable pickles and pickled pepper. Cluster 3: dried tomato/confit and pickled mushroom.

Chart 3. Main non-conformities identified in Block 8—Nutritional labeling of packaged foods.

Nutritional labeling of packaged foods	Non-conformity	% (n)
Mandatory nutrition labeling	Lack of nutrition labeling.	51.7 (n = 30)
Energy and nutrient value declaration	Lack of declaration of energy value, as well as of carbohydrate, protein, total fat, saturated fat, trans fat, dietary fiber, and sodium amounts.	56.7 (n = 33)
Nutrition labeling presentation	Nutritional labeling was not presented in compliance with models described in APPENDIX B of RDC resolution n. 360/2003 (Brasil, 2003c).	34.5 (n = 20)
	Lack of declaration of energy value and daily value rate (%DV) in whole numbers.	67.2 (n = 39)
	Labels did not express nutritional information per portion, such as the corresponding homemade measure and in %DV.	75.9 (n = 44)
	Lack of the sentence “Your daily values may be higher or lower, depending on your energy needs.”	62.1 (n = 36)
	Lack of the sentence “% Daily Values based on a 2,000-kcal or 8,400-kJ diet.”	67.2 (n = 39)
Packaged food portions	Lack of indication of portion and corresponding household measure in compliance with RDC resolution n. 359/03 (Brasil, 2003b).	79.3 (n = 46)
	Labels did not indicate that the food portion corresponded to the drained phase, whenever applicable.	36.2 (n = 21)
Complementary nutritional information	In violation of the legislation.	3.44 (n = 2)

pickled vegetable categories into clusters of similar non-conformities and clusters of pickled vegetable categories showing dissimilar non-conformities. The shorter the distance between two clusters, the more similar they were.

The first formed cluster comprised samples belonging to the pickled pepper and vegetable pickles categories. The second cluster comprised dried tomato/confit and pickled mushroom samples. The third cluster, in its turn, comprised antipasto/cajonata samples. Dried tomato/confit and pickled mushrooms were the samples presenting the greatest similarity; they were followed by pickled pepper and vegetable pickles.

Non-hierarchical analysis was used to check the formed clusters based on the K-means method. It was done to form clusters of pickled vegetable categories and to investigate the number of non-conformities. Three clusters were herein selected based on the number of clusters found in the dendrogram (Figure 2a). All three clusters formed through the K-means method are represented in Figure 2b. Clusters 1 (comprised samples belonging to the antipasto/cajonata categories) and 3 (comprised dried tomato/confit and pickled mushrooms) recorded the greatest similarity in non-conformity repetitions. Cluster 2 (vegetable pickles and pickled pepper) recorded the largest number of non-conformity repetitions in the list of ingredients (AD-IO), liquid content (AD-IO), expiration date (AD-IO), and nutritional labeling presentation (RN).

Pickled vegetables' labels did not comply with the legislation. Food labels are an important tool to enable consumers' rights to be met (Brasil, 1990). Moreover, they give consumers the autonomy to better choose the food to be purchased (Jacintho et al., 2020).

Assumingly, the hard time experienced by rural family agroindustries to meet the standards imposed by the legislation is one of the reasons why their products do not often comply with legislation. It is so because of knowledge limitations, high costs, requirements incompatible with small-scale production, lack of assistance and technical guidance (Freitas et al., 2023), and informality (Cruz, 2020). Another important factor to be taken into consideration lies in the fact that rural family agroindustries are located in rural areas and it can make it hard for them to have access to information and to hire specialized professionals to help produce their labels. Moreover, the schooling of those in charge of these undertakings is also a limiting factor, as interviews conducted with family agribusiness producers operating in Espírito Santo State have evidenced that 53.4% of them did not finish high school—0.6% of them were illiterate (Vinha & Dias, 2019). These factors point toward the need to provide technical support for family agroindustries to help them comply with the current legislation.

## 4 CONCLUSION

Labels of the herein analyzed products presented non-conformities that go against the health legislation. All products presented, at least, one non-compliance on their label. This finding has evidenced that pickled vegetables produced by family agroindustries operating in the mountainous region of Espírito Santo State fail to follow health regulations at the time to

prepare their products. Thus, consumers' right to have access to adequate, clear information comprising correct specifications, to enable them to make healthier and safer food choices for consumption purposes, was violated.

In light of the foregoing, it is necessary to strengthen inspection actions taken by health surveillance, as well as developing projects in the health field, and in partnership with other, to encourage and help producers to adopt practices in accordance with current legislation. Furthermore, health surveillance-education actions should be intensified among food producers belonging to rural family agroindustries in order to help them improve their products, so that products made available in the market can be safe for human health, comply with sanitary regulations, and enable consumers to have access to quality food and reliable information.

## ACKNOWLEDGMENTS

The authors are grateful to Espírito Santo State's Secretariat of Health and the Institute of Teaching, Research and Innovation in Health (ICEPi—Instituto de Ensino, Pesquisa e Inovação em Saúde) for making available and authorizing the use of data adopted in this research.

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