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Food safety in cassava "flour houses" of Copioba Valley, Bahia, Brazil: Diagnosis and contribution to geographical indication☆

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ABSTRACT

Cassava is one of most important foods in tropical countries, and in Brazil, it is largely processed as cassava flour, which constitutes a staple food. Although cassava flour presents unique sensory characteristics, the majority is produced in artisanal units, which do not adhere to food safety guidelines. Thus, this study aimed to evaluate the hygienic-sanitary profiles of the cassava flour houses of Copioba Valley, Bahia, Brazil. This was a quantitative, exploratory study involving 72 flour houses in the abovementioned region. To evaluate the flour houses, the checklist proposed by the National Service of Industrial Learning was used. This list comprises five dimensions: building conditions; equipment and utensils; workers in the production area, food handling, and sales; raw material and products displayed for sale; and production flow, food handling, sale and quality control. The results showed that none of units met more than 60% of the requirements, which is below the recommended cutoff and indicates poor hygienicsanitary conditions. Equipment and utensils made up the group with the lowest performance (4.54%), whereas the highest performance was observed in raw material and products displayed for sale (45.42%). All blocks were evaluated, and in all flour houses investigated, the results presented a major public health concern due to the abovementioned poor conditions. The study highlighted the problems of food safety in a traditional supply chain in the region. However, simple changes are possible, and these changes would not only have positive effects on the hygienic-sanitary profiles of flour houses but would also have an important social impact.

1. Introduction

Cassava represents one of the main food sources of the tropical regions; its production is estimated to fall just behind that of rice and corn (FAO, 2015). Africa, the Caribbean and Latin America stand out as continents with higher production of cassava for human consumption (UNCTAD, 2012).

From a historical perspective, the growth and use of cassava for human consumption in Brazil is associated with the country's indigenous culture and dates back to its discovery. Thus, over time, products such as cooked root, cassava flour and tapioca[1] were gradually incorporated into the eating habits of Portuguese people

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[1] Tapioca is the starch that is extracted from cassava roots.

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and slaves, ultimately becoming one of the identifiable features of Brazilian food culture (Cascudo, 2004; Piperno, 2011).

Currently, most cassava root in Northeast Brazil is processed as flour, and the production chain for this flour is characterized by the use of family labor forces in hundreds of small units called cassava flour houses ("casas de farinha"). The majority of cassava flour houses follow traditional, artisanal methods and operate in very simple structures that frequently lack adequate conditions for the appropriate and safe processing of foods and other products (Cardoso, Müller, Santos, Homma, & Alves, 2001).

Although cassava flour processing uses simple technology, precautions are required. These include the proper selection of raw materials and the use of proper hygiene practices and correct handling procedures during production to guarantee the quality of the final product. Nonetheless, with regard to the family-run flour production facilities of the Northeast, studies have raised concerns about product safety (Cardoso et al., 2001; Raspor, 2008).

Good manufacturing practices (GMPs) are considered among the most useful tools for the improvement of hygienic conditions in food processing and are highly beneficial instruments to achieve safety in the final product. In addition to mitigating hazards, GMPs also provide a more efficient and organized environment for work, optimizing the entire production process (Baş, Yüksel, &, Çavuşoğlu, 2007).

In the state of Bahia, the tradition of cassava flour production and trade has been preserved. The production of a flour called Copioba is particularly high; this flour is famous and renowned for its fine granulation and crispy texture, which is superior to that of other cassava flours (Castellucci Júnior, 2008). Given the historical and geographical importance of the production of this flour, which involves local knowledge, quality characteristics, identity and popularity, Copioba cassava flour meets most of the requirements for geographical indication[2] (GI).

Products that are eligible for GI must comply with legislation aimed at the producers' organization, the processing methods, the quality criteria for production standardization, and the establishment of regional and local marketing, as well as a sales network (Branco et al., 2013).

Thus, given the popularity of Copioba cassava flour, its eligibility for GI and the scarcity of studies on the hygiene practices associated with its production, this work aimed to evaluate the hygienic-sanitary conditions of cassava flour houses in Copioba Valley, Bahia, and to promote food safety in this production chain and the GI candidacy of cassava flour.

2. Materials and methods

An exploratory and quantitative study was performed with cassava flour producers from Copioba Valley, Bahia, Brazil. Fieldwork was conducted from November 2012 to February 2014 as part of the project entitled "Quality, identity and notoriety of cassava flour of Nazaré das Farinhas, Bahia: a contribution to Geographical Indication".

After identifying producers, we established communication with the individuals responsible for the flour production units, which resulted in the participation of 72 flour houses.

To evaluate the hygienic conditions of these flour processing facilities, the Checklist for the Establishment of the Food Manufacturing Area (CEFM) was used; this checklist is recommended by the Safe Food Program of the National Service of Industrial Learning ("Serviço Nacional de Aprendizagem Industrial" – SENAI, 2000). The CEFM involves most of the items necessary to ensure safety in food processing and classifies the flour house units in terms the percentages of requirements they meet.

The CEFM contains 60 questions that are organized in four parts as follows: A – Identification, B – Evaluation, C – Score of the establishment and D – Registers of observations. Part A, in addition to identifying the production establishment, includes complementary research information and records.

Part B, Evaluation, is designed to record information related to the evaluation itself and is structured in five blocks:

Block 1, referring to building conditions, comprises nine dimensions involving 22 questions (indicators): 1. Floors (2); 2. Linings and Roof (2); 3. Walls and partitions (2); 4. Doors and windows (4); 5. Sanitary facilities (2); 6. Changing rooms (2); 7. Wash basins in the food handling area (3); 8. Water tanks and water installations (2); and 9. Waste disposal (3).

Block 2, related to equipment and utensils, comprises five dimensions involving 10 questions: 1. Equipment and machines (2); 2. Utensils (2); 3. Furniture (2); 4. Equipment for refrigeration (2); and 5. Cleaning and disinfection (2).

Block 3 evaluates workers in the production area, as well as food handling and sales. This block comprises two dimensions involving six questions: 1. Clothing/garments (4); and 2. Worker health (2).

Block 4 concerns the raw material and products displayed for sale and comprises only one dimension involving four indicators. Block 5 comprises four dimensions, which are associated with production flow, food handling, sales and quality control. These dimensions encompass 14 questions, which are distributed as follows: Proper flow (2); Protection against contamination (2); Proper storage (4); and Packing and labelling of the final product/product displayed for sale (6).

Each block was scored with a specific weight to obtain a global grade, as shown in Table 1.

To calculate the score for each block, a particular constant (K) was used. This procedure was applied to avoid penalizing establishments in cases in which some of the evaluated items were considered not applicable/available (NA). The values of the constants are described below:

Constants for each block:

1 Building conditions: K1 = 60;
2 Equipment and utensils: K2 = 50;
3 Workers in production area, food handling, and sales: K3 = 32;
4 Raw material and products displayed for sale: K4 = 24;
5 Production flow, food handling, sale and quality control: K = 53.

Part C, the score for each block, was calculated according to the following mathematical formula:

$$WB = \sum S \times W/K - \sum NA$$

in which:

WB = score of the block
$\sum S$ = sum of items of the block that received appropriate classification
$\sum NA$ = sum of items of the block that were considered not applicable
K = block constant
W = specific weight of the block

[2] In Brazil, GI represents a way to qualify products and services that are assigned intrinsic and unique characteristics. These characteristics bind them to their production region of origin, with specific qualities related to the environment (geography, climate, soil) or to the traditional knowledge passed from one generation to another in a given culture (BRASIL, 1996; Giovannucci, Barham, & Pirog, 2010; Branco et al., 2013).