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IMPLEMENTATION OF THE HACCP QUALITY SYSTEM FOR AMANDINA CAKE

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ABSTRACT

The application of HACCP for confectionery products is compatible with the implementation of quality management systems, from the SR EN ISO 9001, 2001 series and with food safety management from the SR EN ISO 2200, 2005 series. HACCP was applied to all stages of obtaining Amandina cake starting from the storage of raw materials to the completion of the technological process, and its implementation was based on compliance with the principles of quality and safety in the food industry. In order to ensure the safety of the studied food, the HACCP implementation was carried out strictly respecting the implementation stages. The main purpose of applying the HACCP manual within the processing unit was to facilitate verification by the authorities and to promote local trade by increasing confidence in food safety. The detailed analysis of the requirements and the way of designing and implementing the HACCP system in the confectionery-pastry processing unit also aims to launch a model of the quality manual for a confectionery product appreciated by consumers, namely the Amandina cake.

INTRODUCTION

Confectionery products are dessert products characterized by a very wide variety of assortments and obtained by different technological processes from flour, sugar, eggs, dairy products and fats (as basic raw materials), with different creams and fillings, ornaments and shapes which give the diversity of these products; they are intended for direct consumption, fresh or refrigerated (Campbell et al. 2002, Manailescu et al. 2003, Pareyt & Delcour 2008, Roy et al. 2010, Rajiv et al. 2012, Mancebo et al. 2015, Ciudad-Mulero et al. 2020, Tas & Shah 2021, Soares et al. 2022, Yongshuaiet al. 2023). Confectionery products are widely accepted and consumed in many countries and therefore provide a valuable supplement vehicle for nutritional enhancement (Arshad et al. 2007, Souza et al. 2013, Cappa et al. 2020, Chavan et al. Kadam, 1993). The term cookies, or biscuits as they are called in many parts of the world, refers to a baked product that generally contains the three major ingredients of flour, sugar and fat. These are mixed together with other minor ingredients to form the dough (Chevallier și colab. 2000, Mamat et al. 2010, Mamat & Hill 2014; Pareyt and Delcour 2008).

The best practices guide for Confectionery/Pastry focuses on the analysis of HACCP risks and the elaboration of measures to prevent these risks regarding the procedures for the transport and processing of raw materials and the sale of

finished products. Also, the guide contains a series of food safety rules that must be applied by the personnel involved in this process. The quality of food and, above all, its innocuousness has always concerned specialists and, year after year, recipes, practices, treatments, methods have been improved so that they increase their value, their contribution to health and the harmonious development of the body human (Scorei et al. 1998, Ionete et al., 2006, Di Renzo et al. 2015, Marin 2018). The analysis of hazards and the determination of critical control points represent a method of systematic approach to ensuring food safety, based on the identification, evaluation and prevention of all risks that could intervene in the process of their manufacture, handling and distribution (throughout the food chain) and keeping under control of risks from critical points (Taban & Aytac 2014, Mortimore & Wallace 2015, Costea et al., 2017, Ramírez-Guzmán et al. 2018, Tutu & Anfu 2019).

MATERIAL AND METHODS

The methodology and development of the HACCP plan for the Amandina cake was based on the seven quality principles that constitute the guidelines for the implementation of the HACCP system.

Thus, for the Amandina product, the following principles were applied:

Principle 1. Perform hazard analysis (HA) for the identification of physical, chemical, and biological hazards.

Principle 2. Identification of critical control points (CCPs) according to the decision tree.

Principle 3. Establishing critical limits (CL) to ensure uniformity in the safety analyses of the processes involved.

Principle 4. Monitoring each CCP.

Principle 5. Establishing corrective actions to be executed when monitoring indicates a deviation from a predefined critical limit.

Principle 6. Establishing effective record-keeping procedures.

Principle 7. Establishing procedures for verification that the HACCP system is working correctly (according to Jubayer et al. 2022).

The design of the quality control system (HACCP) for the Amandina cake was carried out within the company SC Visli SRL, section: production, with the production and distribution of confectionery products as the object of quality.

RESULTS AND DISCUSSIONS

The confectionery industry is at the top of preferences, being a product category appreciated by a wide range of consumers, from childs to the elderly. Like any food product, confectionery products have restrictions in terms of excess consumption, having in their composition a significant number of ingredients, which bring a significant caloric intake. The nutritional value of the cake with Amandina top is determined by the complete proteins (provided by the eggs in the top and the milk in the cream composition), associated with the vegetable proteins in the flour, the easily assimilable lipids in butter or margarine, rich in fat-soluble vitamins (A and D), as well as the simple carbohydrates provided by the three main semi-prepared foods: topping, syrup, cream, chocolate. The implementation stages for the HACCP quality manual, edition I, revision 0, within the company S.C. VISLI S.R.L. describes the ensuring the safety of food products, for the Amandina product. The HACCP manual was approved, the statement of the general manager

was obtained, the company was presented as well as the organizational chart of the company. The purpose of implementing the HACCP system was defined. In this sense, the management of the company decided on the need to implement the HACCP system in the production section of the Amandina cake, for microbiological, physical and chemical hazards, and the action will be extended to the company level. This decision was taken to increase the confidence of customers in the security of the products offered by the company, the action being made public through the statement of the general director. The HACCP team was established, which has the tasks of developing the technical specifications for raw materials, ingredients, packaging, finished products; elaborates the technological flow diagram; carry out hazard analysis; determine PCC; establishes the monitored parameters in each PCC; instructs the members regarding the monitoring method, the purpose and importance of the activity. Each member of the team has a specific attribution: the quality director (verification of the quality of the finished product and flow control); technological engineer, responsible for establishing the recipe and the technological flow; the laboratory technician, responsible for performing the analyzes included in the flow quality control plan; mechanical or automatic engineers, responsible for the proper functioning of the machines; sanitation and hygiene specialists.

In order to build the technological flow diagram, the following was developed: manufacturing technological scheme (block diagram) (Figure 1); technological flow diagram; scheme of location of machinery.

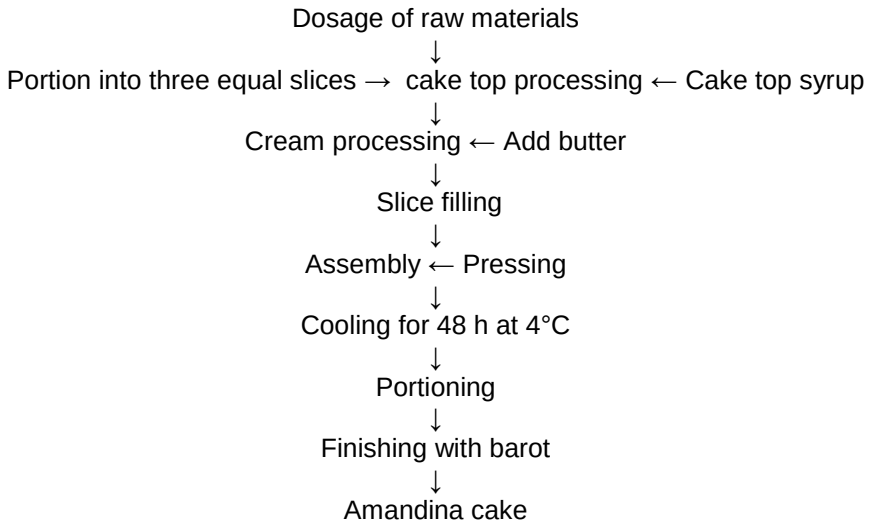

Figure 1. Technological scheme for obtaining Amandina cake

After establishing the technological scheme for obtaining the Amandina cake, we moved on to identifying the risks at each technological stage. The identification of risks consisted in establishing their nature (physical, chemical, microbiological), in taking preventive measures as well as in establishing the monitoring system (preparation of control sheets). The assessment plan and hazard analysis was carried out. To establish the PCC, the HACCP team applied

the Decision Tree method (Table 1).

Table 1

Identification and analysis of hazards in the technological flow

No. crt.	The product/ stage process	Hazard potential (PCB)	It is the danger potential significant?	Control measures (prevention)
1	Storage of raw materials	✓	PCC*	- compliance with humidity in storage; - keeping raw materials in specially designed spaces.
2	Obtaining cake top	✓	PCC	- the impurity content should be as low as possible; - compliance with the ingredients provided in the recipe; - observing the mixing time; - respecting the baking temperature.
3	Obtaining cream	✓	PCC	- correct weighing of ingredients; - observing the mixing times; - compliance with the dosages of the raw materials present in the recipe; - compliance with the boiling temperature; - safe materials are used.
4	Obtaining barot	✓	PC*	- the chocolate mass finely shredding; - compliance with technological; -parameters regarding temperature and humidity; - compliance with the manufacturing recipe.
5	Finished product storage	✓	PCC	- perfectly proper sanitation of storage spaces and packaging; - perfect hygiene of personnel and work equipment.
6	Finished product delivery	✓	PC	- perfect sanitation of the transport space; - perfect personal hygiene; - placing shuttles with products on wooden pallets.

(*PC- Critical Point; *PCC-Critical Control Point; *PCB-physical, chemical, biological)

The following possible dangers were highlighted in certain phases of the processing process: reception of raw materials (cocoa, milk powder, flour, eggs, sugar) - probable contamination; storage of raw materials (cocoa, milk powder, flour, eggs, sugar, butter) probable contamination - occurrence of the oxidation process if the storage conditions (temperature and humidity) are not respected; appearance of mold; organoleptic degradation; leakage of substances used in the technological process (theoretical)-the machines do not meet the required

standards; the storage/storage of the Amandina cake – the probable contamination of the product if the storage conditions are inadequate. After the PCC were analyzed, the critical limits were established by creating control sheets to monitor compliance with the control limits at the critical control points (Table 2, 3, 4, 5). And Jubayer et al. in 2022 study implementation of HACCP Management System in a Cake Manufacturing Company in Dhaka, Bangladesh.

Table 2

Magnet maintenance registration form in PCC_1- Exemplary 1- S.C. Visli S.R.L.

Obtaining cake top

Date	Magnet charge degree%	Magnetic capacity check	Magnetic cleaning	RSA* signature	Correction / corrective action
21.02.2023	6%	✓	✓	✓	-

(*RSA -electronic signature)

Table 3

Registration form parameters in PCC_2- Exemplary 1-S.C. Visli S.R.L.

Top formation

Batch	Product	Baking temp.	Baking time	Responsive Signature	Finished product/temp.	RSA Signature	Correction /corrective action
1	Cake top Amandine	170ºC	35 min	✓	4ºC	✓	-

Table 4

Registration form parameters in PCC_3 - Exemplary 1-S.C. Visli S.R.L.

Cream obtaining

Batch	Product	Boiling temp.	Boiling time	Responsive Signature	Finished product/temp.	RSA Signature	Correction /corrective action
1	Cream cake Amandina	120º C	40 min	✓	4ºC	✓	Nu

Table 5

Registration form parameters in PCC_4 Exemplary 1-S.C. Visli S.R.L.

Barot processing

Batch	Product	Barot temp.	Barot processing Time	Responsive Signature	Finished product/ temp.	RSA Signature	Correction /corrective action
1	Barot training Cake Amandine	18º C	10 min	✓	16ºC	✓	

After establishing the critical limits, rules and responsibilities were established for the development of the corrective action application process followed by the establishment of the documentary system. The verification of the implementation of the HACCP system was carried out by establishing an internal audit with the aim of establishing whether the activities/processes of the HACCP system and their related results are in accordance with the planned activities and whether these activities are actually implemented allowing the achievement of food safety objectives. It was not necessary revision of the HACCP system.

CONCLUSIONS

The use of the HACCP system serves to improve the control of the protection of food products in case of potential hazards that could contaminate the food, and must be applied for this purpose. The analysis of the current application of the HACCP system in food control activities and the impact it can have on the food trade is required for the harmonization of international principles with those of the HACCP system. The economic implications of HACCP are discussed with reference to cost and benefit estimates in particular for the food industry. The use of HACCP can lead to the development of mutual recognition agreements.

In the framework of this study, the implementation of the HACCP system was carried out in the context of obtaining the Amandina cake, which consisted of going through the 14 stages in compliance with the principles of implementation. In this sense, it was aimed to create a HACCP team of specialists from different fields who would have competence in the implementation the system.

The company, its organizational structure, documentation, infrastructure and technology for obtaining the Amandina cake were presented. In this sense, the organizational chart of the company, the technological scheme for obtaining the studied product, as well as the technological flow diagram and the location of the machines in the production section were established.

The HACCP team and the plan were established with the definition of the purpose of the action, the description of the analyzed raw materials, the finished product and the work methods. The identification of the given use, the field verification of the manufacturing diagram, the performance of the hazard analysis took place. In order to determine the critical control points, the critical limits, the monitoring system and the corrective actions where appropriate have been established.

After performing the hazards analysis, five critical control points (CCP_5) were found as follows: CCP_1-storage of raw materials, CCP_2- obtaining cake top, CCP_3- obtaining cream, CCP_4- obtaining barot and CCP_5-finished product storage. For the monitored critical control points, the critical limits, monitoring system and corrective actions were established where appropriate.

A documentary system was established, the implementation of the HACCP system was verified as appropriate and data on the revision of the applied system was analysed.

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