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Implementation of an Integrated approach HACCP System and ISO 22000: 2005 in a unit of capers preservation

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Abstract: With the international globalization of the trade of the foodstuffs, the infectious agents can be propagated in areas everywhere in the world, and with the development of the fast means of transport, a product manufactured in a country, can be consumed some hours afterwards in other countries, and if the product is initially contaminated, this contamination could be diffused everywhere the product is marketed. Be added to this situation, of the lawful requirements, the tightening of international competition and demands more and more increasing from customers. To face these challenges, and to protect more the public health, the adoption of the systems of control of the hazards related to food safety is necessary. The HACCP system (**HAZARD ANALYSIS CRITICAL CONTROL POINT**) and the ISO 22 000 system are appropriate to this situation. This article presents an application of setting up an integrated HACCP/ISO 22000 in an industry of capers preservation.

Key words: HACCP, ISO 22000, CCPs, OPRP

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Introduction

As there's many hazards associated with foods that can bring harm to the consumer, food safety is a question on the agenda. Since each year, hundreds of million people suffer from infections and intoxications causes by food contaminated (FAO, 2002). Food quality and safety have various and deep implications on human health (Rotaru, 2003).The quality of food affects the health of the consumers and can also affect the health of the future generations; it is well known that food can lead the consumers to become sick. If technology, the criteria of hygiene of the production, handling, the transport and the stages of marketing and distribution are not suitable (Rotaru and Bordered 2007).

In the last decades, with the development of processing methods, the food chains became increasingly complex and it represents today a significant stake which require specific measures intended to ensure an acceptable level for food safety (Rotaru and Al, 2001).

Indeed, HACCP and the management system of food safety ISO 22000 are conceived to prevent the appearance of possible problems of food safety, by an evaluation of the hazards inherent in a product or a process and then a determination of measurements necessary will make it possible to control the identified hazards. The goal to establish an integrated system HACCP/ISO 22000 is to minimize the hazards associated with the biological agents, chemical and physics on an acceptable level, there will give the possibility of remaining concentrated rather on the prevention than to wait until the problems arise be solved. (Mortimore and Wallace, 1998).

Concept HACCP was elaborate in the Fifties by the Pillsbury Company in collaboration with NASA (National Aeronautic and Space Administration) and the laboratories of the American army of Natick. It was founded on the Failure Mode and Effect Analysis: FMEA). With the origin, the HACCP was developed like a microbiological system of safety in the beginning of the American program of the

space missions to ensure the food hygiene of the astronauts (Mortimore and Wallace, 1998; Marriott and Al., 1991) described concept HACCP as a rational approach to control hazards of food compared to what does not the traditional inspection. The HACCP is recommended by the Codex Alimentarius Committee on the food hygiene (1993) and Advisory the National Committee for the Microbiological Criteria applicable to the Food (NACMCF, 1992) in the United States. The ISO 22000 management systems for food safety goes beyond the recommendations made in 1993 by the Codex Alimentarius.

Materials and Methods

Prerequisite programs

1. Good Hygiene Practices (GHP) since the contamination by staff represents one of the most frequent problems in food industry, it is necessary to ensure an adequate level of hygiene and to follow the requirements of hygiene by staff, compulsory measures relate:

- Control periodic medical health staff;
- Training programs on GHP and protective equipment;
- Good Manufacturing Practices (GMP) can prevent contamination;
- Periodic cleaning of spaces and the equipment;
- Fight against the devastating and the vermin (Heggum, 2001).

2. Good Manufacturing Practices (GMP) representing a combination of technical, instructions and quality insurance procedures.

3. SQA (Supplier Quality Assurance) programs to ensure the quality of raw materials and other materials used in the product manufacture. It may be audits and inspections of suppliers (Rotaru and Bordered, 2007).

Field of application. HACCP/ISO22000 System takes into account the biological, chemical and physical hazards associated with capers from one end to another with the manufacturing process since the reception of the raw materials until forwarding of the conditioned finished product (Figure 1).

Implementation of HACCP plans and Operationel Prerequisite programs OPRP (see table 1).

1. HACCP team. A multidisciplinary team was composed of seven persons possessing different skills related to quality assurance, production, engineering, microbiology and so on. Members of this team have been trained very thoroughly on the HACCP and ISO 22000.

2. Product description.

Product name: capers in vinegar

Water activity < 0.6; pH < 3.5; acidity 1.6±0.5; NaCl 7±2%

Wealth of natural inhibitors: tannins and saponins

Total microbial counts/1g < 10. 000

Salmonellas/25g: absence; staphylocoques/1g: 10

Colifoms/1g: 10; clostridium/1g absence; yeasts and moulds/1g: absence

Packaging: Packaging airtight jars and cans

Shelf life: 4 years at room temperature, but after opening up 1 month kept in cold

Conditions of use: the caper is a condiment which can be consumed cold or hot as such or in a mixture with many dishes cooked such as: fish; pizza, salads. the capers can be consumed by all categories of people, except for infants and vulnerable to savory and spicy.

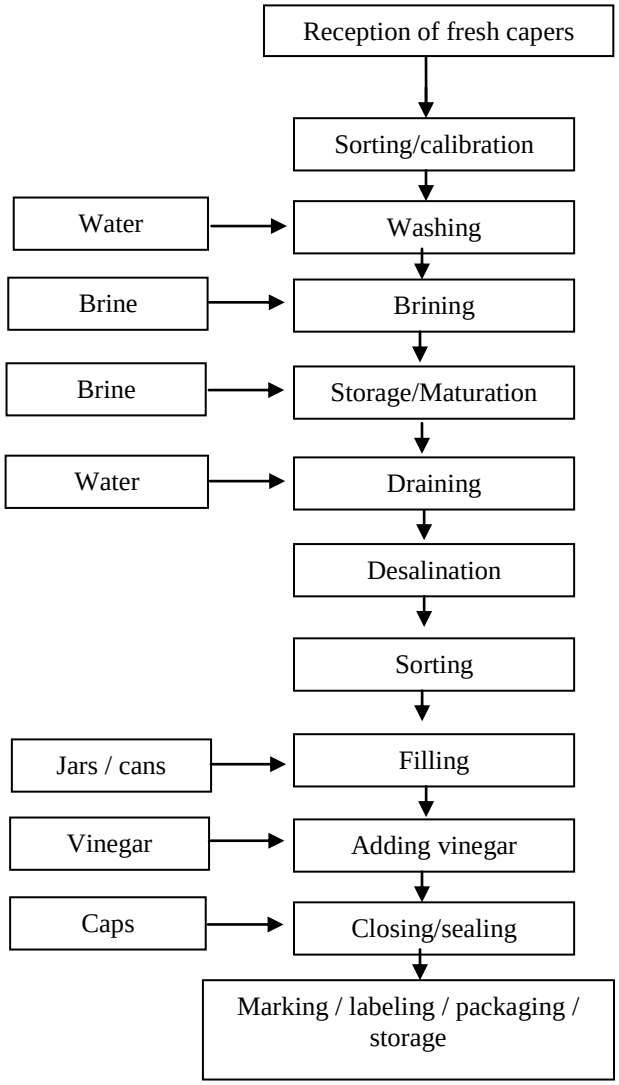

Figure 1. Flow diagram of capers

Table 1. Steps and principales for the HACCP application.

Preliminary Step	Principales
1. Assemble the HACCP team. 2. Describe the food and the method of its distribution. 3. Identify the intended use and consumers of the food. 4. Develop a flow diagram which describes the process. 5. Verify the flow diagram.	1. Conduct a hazard analysis. Prepare a list of steps in the process where significant hazards occur and describe the preventive measures. 2. Identify the CCPs in the process. 3. Establish critical limits for preventive measures associated with each identified CCP. 4. Establish CCP monitoring requirements. 5. Establish corrective action to be taken when monitoring indicates that there is a deviation from an established critical limit. 6. Establish effective record-keeping procedures that document the HACCP system. 7. Establish procedures for verification that the HACCP system is working correctly.

Pierson, 1995

Table 2. Grid hazards assessment

Criterion	Notation	Classification
Severity (S)	1	Minor: no impact on consumer health
	3	Major: limited impact on consumer health
	5	Critical: serious consequences on consumer health
Probability (P)	1	Rare: low probability of occurrence of hazard
	3	Moderated: occasional appearance of hazard
	5	Very frequent: high probability of occurrence of hazard
Criticality (C) = Sévérité× Probability		

C = 25 point (maximum) and 1point (minimum**)**

3.Flow diagram.
Flow diagrams have been prepared taking into account all aspects of the process in the scope of the HACCP system. The flow diagrams were checked on site by the HACCP team

4. Identification and assessment of risks / determination of OPRP and CCPs. HACCP Team listed all potential hazards (biological, chemical and physical) which could harmfull health of the consumer following a bad quality of the raw material, or following a failure during manufacture. The risk analysis was conducted using a scale developed by the HACCP team, while being based on the severity of the danger and its probability of appearance. The scale is presented on table 2.
Initially, all hazards have been taken into account. Then, some hazards were unloaded from the list drawn up following their criticality is strictly <9 and severity ≤ 3 , an example is given in Table 3.
4.1.Determination of OPRP. The OPRP identified are presented in Table 4.

Table 3. Example of Evaluation of the risks

Identification and evaluation of the hazards/Selection and evaluation of measurements of control						
Ingredient	**Hazards**	**Risk**	**S**	**F**	**C**	**Preventive measures**
Salt reception	• Biological	• Halophilous micro-organisms	3	1	3	Filtration and decantation
	• Physical	• Presence of dangerous foreign body in salt.	5	1	5	Control zones of supply salt, Requirement for a certificate of analysis per batch
	• Chemical	• Presence of heavy metals: Pb, Hg, Cd, As and Cu.	5	1	5	Questionnaires suppliers. Supplier Audits
vinegar (Wine/alchol)	• Biological	• Micro-organisms acidophiles	3	1	3	
	• Physical	• Presence of dangerous foreign body	5	1	5	Obligation to have a certificate of analysis for each batch of vinegar.
		• Allergens (sulphur dioxide SO_2)	3	1	3	
	• Chemical	• Presence of chemical contaminants (methanol, chlorides…)	3	1	3	
Water	• Biological	• Risk contamination of the product by micro-organisms coming from water (total coliformes and total count).	3	1	3	Bulletins of analyses suppliers of water
Preparation of the Brine	• Physical	• Risk contamination of the brine by foreign bodies.	5	1	5	Decantations and filtration
	• Biological	• Proliferation of pathogenic micro-organisms during the maturation (fermentation) of the capers (moulds, *E.coli*).	5	1	5	Procedure of transport and storage of the raw and ingredients. Control degree Baume of the brine.
Filtration of the brine	• Biological	• Proliferation of the micro-organisms following the filling of the filters	3	1	3	Preventive maintenance and change of the filters
	• Physics	• Passage of the foreign bodies following a deterioration of the filters	3	1	3	
Dilution of vinegar (alcool/wine)	• Physical	• Risk presence of foreign bodies.	5	1	5	Drinking water
	• Biological	• Risk of subsequent development of pathogenic microorganisms by dilution loss (moulds, *Staphylococcus aureus*)	5	1	5	Qualification of the staff in charge of the dilution of the vinegar Limited access to the basins of dilution of the vinegar Acidity control Method of vinegar storage
Filtration of vinegar (wine/alchol)	• Physical	• Passage of the foreign bodies following a deterioration of the filters	3	1	3	Preventive maintenance and change of the filters
	• Biological	• Proliferation of the moulds acidophiles on the filters	3	1	3	

Table 4. Operational prerequisite programs (OPRP)

Stage	N° OPRP	Hazard	Measurements of control	Monitoring				Corrective action
				How	Frequency	Responsibility	Recording	
Reception fresh capers	**OPRP-1**	Residues of pesticides, heavy metals, mycotoxins	Respect of good honest practices of capers code Analyzes of samples with each season	Analysis of Samples purchasers sensitization	each new season	Quality manager	Spreadsheet analysis Register of the formations and qualifications	Repress lot Programing new meetings of sensitizing of the purchasers
Salt reception	**OPRP- 2**	Heavy metals	Analysis reports sent to each crop by the supplier	Each batch (new crop) is analyzed by the supplier	Each harvest	Quality Manager	Spreadsheet analysis	warn the supplier draw aside the batches not-in conformity
Preparation of brine	**OPRP- 3**	Development of micro-organisms (moulds) in the products (% salt insufficient)	Respect of the procedure of preparation of the brine	Control of pools of brine each morning to start	1 control of each pool/once per day	Brine preparer	Card : Preparation of brine	Reset the salt content If the brine is already used, sort the manufactured products and correct their salt content
Dilution of the vinegar	**OPRP- 4**	Development of micro-organisms in the products (insufficient of acidity)	Respect of vinegar dilution procedure	Each dilution is controlled before use	Each preparation	Personal of quality control	Card: vinegar dilution	Correct acidity in the pools before use
Reception of the barrels, bottles, cans	**OPRP- 5**	Dangerous foreign body	Washing/blowing Control at the reception	Manual washing barrels washing and automatic blowing of cans, bottles and pots sampling	Each reception	Team Cleaning and Sanitation (CS) Personnel of quality control	Spreadsheet CS Spreadsheet controls at the reception of packing	Draw aside the batches not-in conformity Sensitizing of the operators Change the parameters of blowing
Storage/maturation of capers	**OPRP- 6**	Development of moulds	Continuous pickling of the barrels	A random visual monitoring of a sample (20 barrels)	1 time/15 days	Personnel of quality control	Card: Storage/maturation of capers	Adjust the brine level draw aside the barrels touched to determine healthiness of it

4.2.CCPs identification. CCPs were identified by using the codex alimentarius decision tree (figure 2)

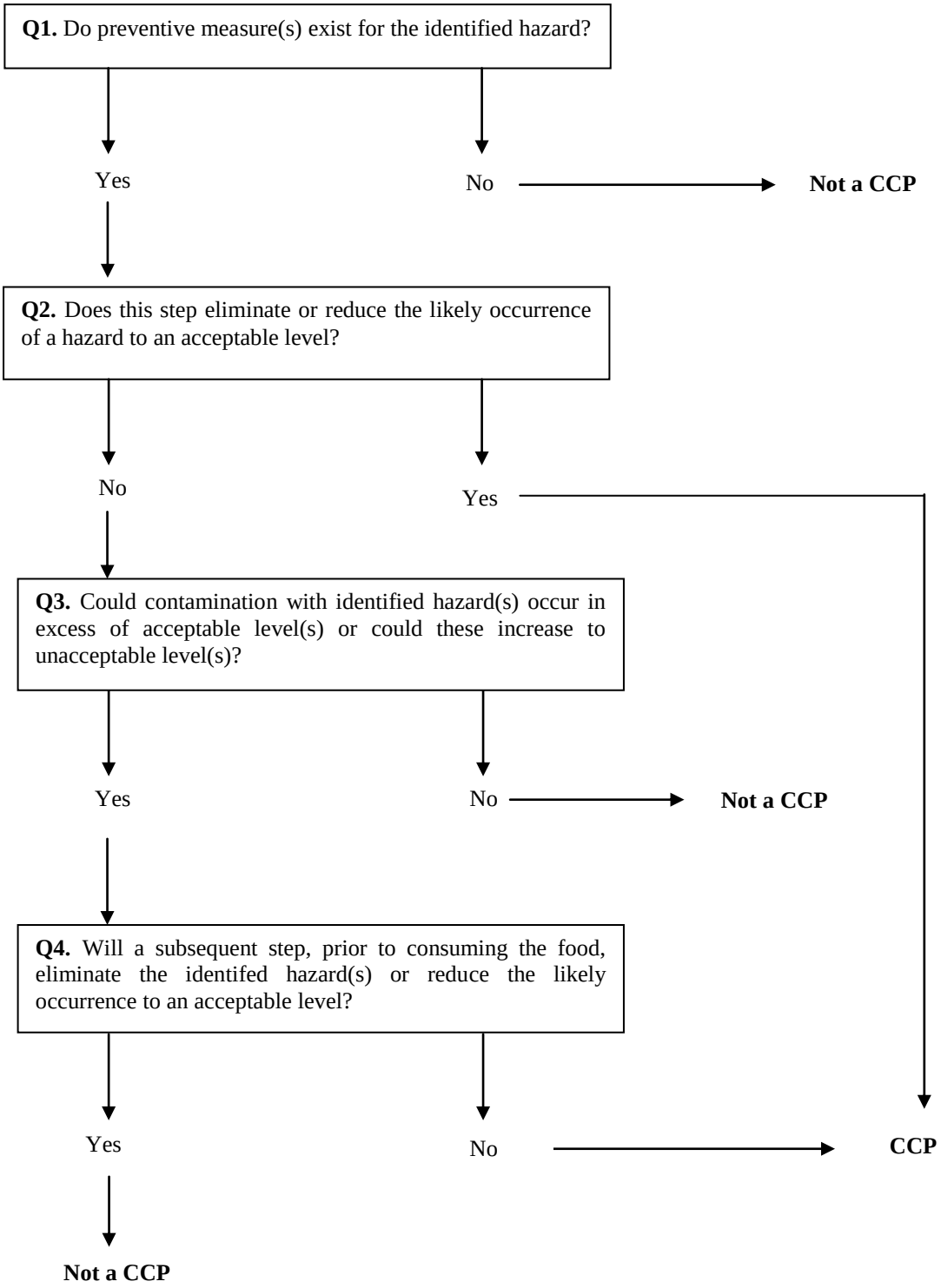

Figure 2.The codex alimentarius Critical Control Point Decision Tree

Table 5. HACCP Plan Capers in vinegar of alchol / wine

Stage	N° CCP	Criterion to be supervised	prevention measure	Critical limits	Monitoring			Registers	Corrective measurements	Checking
					How	Frequency	Person in charge			
Sorting/ convoying	**CCP 1 - P**	Presence of the dangerous foreign bodies: stones, pieces of metals, jewels, insects…	Sensitizing of sorting workers . Respect of the GHP & GMP Installation of the kill flies Continuous assessment of the product before its conditioning. Installation of a magnet	Absence of the dangerous foreign bodies: pieces of metals, wood, stones, jewels, insects…	Visual control of foreign bodies in the finished product	once each hour. 2 units/sample	Personnel of quality control.	Card: Sorting	Alert the head of manufacture. Resorting of the products manufactured meanwhile.	The person in charge quality examines the registers daily

5. Establishment of the critical limits /monitoring system/corrective actions.

In each stage or process considered critical, critical limits were selected and defined so that their going beyond indicates the slip towards of danger zone, but well before the appearance of the hazard. During the establishment of the critical limits, we took into account the regulation in effect and the guides of the good practices.

Specific procedures of monitoring were established for each CCP. Corrective actions were established for each CCP if the monitoring indicates a going beyond of the critical limits (Table 5).

6. Establishement of the procedures of verification /documentation and recordings

The documents and the recordings were established and preserved to ensure that the controls of corresponding to the system are installed and were maintained.

Results and discussion

All the stages of implementation were followed stage by stage, all the procedures necessary of control and checking were established to check and confirm if HACCP / ISO22000 system is implemented in accordance with the principles of the codex and standard ISO22000/2005. The analysis of the risks was carried out to identify the hazards which can occur in the cycle of production, the preventive measures were established, CCPs and OPRP was determined and posted at the factory, the critical limits for each CCP were defined and validated. A monitoring system is established to be ensured if the critical limits are respected and OPRP are mastered. The recordings relating to this monitoring are held up to date. Procedures of checking were established to confirm if plans HACCP/ISO22000 are effective (internal audits). Thus documentation concerning all the processes, the procedures, measurements and the recordings were appropriate with the nature and the size of the company.

Conclusions

HACCP/ISO22000 System was effectively put in place and certified by the Moroccan ministry for industry. OPRP were established to control the hazards, and consequently, to simplify HACCP plan and the OPRP programs. 1 CCP was identified with 6 OPRP.

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