

ASPECTS REGARDING THE IMPLEMENTATION OF HACCP (HAZARD ANALYSIS AND CRITICAL CONTROL POINTS) SYSTEM ON THE “FOURTH GAME” HORTICULTURAL PRODUCTS

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Abstract

HACCP is the abbreviation for the English expression “Hazard Analysis Critical Control Points”. To obtain high - quality products, capable of meeting the consumer’s demands and complying with the food safety standards, certain risk-prevention and control methods should be applied. In the horticultural products processing company, the application of an HACCP system allows the identification of the key-elements of the technological process. The system analyses the hazard related to the product and the process, indicating the critical control points to the hygienic quality of the product. Starting with the fact that some of these products are ready to eat (e.g. the „fourth game” horticultural products), there are major concerns regarding the level of pesticides and other chemical contaminants, the maintenance of hygiene during harvesting, handling, processing, storage, and commercialisation. In order to prevent or reduce the above-mentioned hazards, the big specialised companies and small producers must apply HACCP prevention methods, not methods based on the final product control (which may affect consumer’s health and may lead to important economic loss). Therefore, this paper contains a HACCP study, characteristic for “ready to eat” vegetable products and explains the management of the identified CCPs.

Key words: CCPs, HACCP, food safety.

INTRODUCTION

The sanitary status of food products is a foremost quality attribute, even though it is among the less discernible traits for the consumer (Arvanitoyannis I.S., 2009).

Fresh horticultural products are the main source for diet fiber and vitamins, but can convey chemical, physical, and microbial hazards and contaminants or some synthetic pollutants (residues of fertilizers, herbicides and pesticides). Food safety management systems like ISO 22000:2005, IFS and BRC (all containing the Hazard Analysis and Critical Control Points-HACCP) can secure food safety by preventing potential hazard at source points of the process (Varzakas T. et al., 2008).

In order to guarantee the food safety products, it would be desirable to structure the production according to HACCP principles. In the minimal processing (“ready to eat”) of horticultural

products, the critical control points can be detected mainly for microorganisms (Chira A. et al., 2007).

MATERIALS AND METHODS

The studies were carried out on the processing of ready to eat vegetables salad (cabbage and carrots), according to the flow diagram described in Figure 1.

For each step of the process the risk analysis was performed, in order to identify the chemical, physical and biological hazards correlated to the product and process and also the preventive actions and control measures which are necessary to keep these hazards under control (Chira A. et al., 2000).

In order to implement specific control measures regarding food safety wherever it is possible, the CCP decision tree was applied.

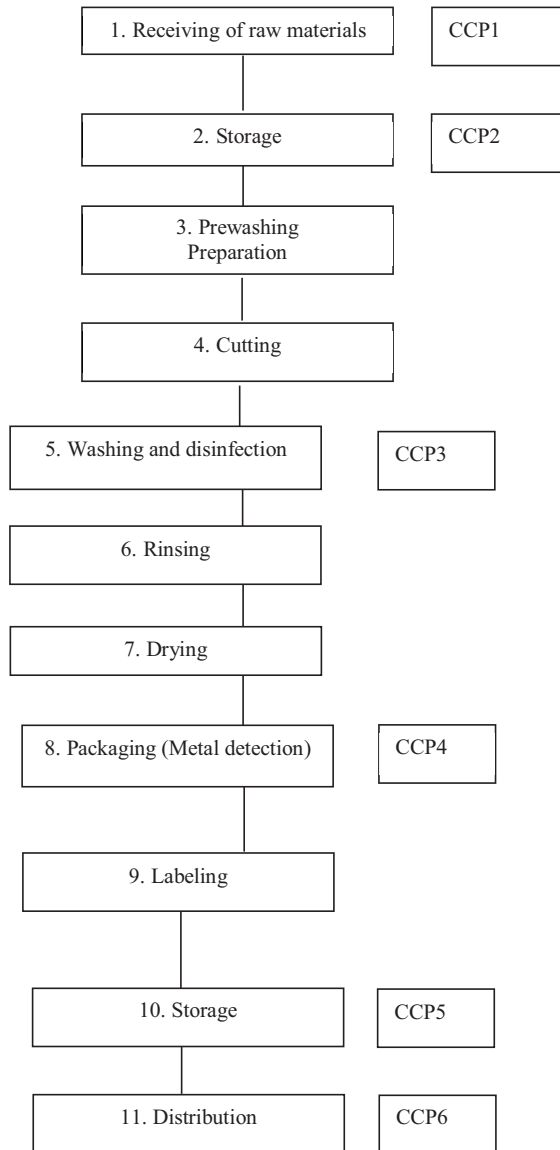


Figure 1. Flow diagram for the processing of the “fourth game” horticultural products

The control of each CCP, according HACCP principles are planned in the HACCP plan and the implementation of the control measures is shown by specific records.

RESULTS AND DISCUSSIONS

Minimally processed horticultural products are in danger of increasing the metabolic activity

which causes their degradation. The natural degradation of freshly cut products determined by processing increases respiration and ethylene production very quickly and the accumulation of phenol substances.

Following these processes, the biochemical reactions are responsible for colour change, taste and nutritional composition (loss of vitamins).

All these aspects could be minimised by cooling the products before the production process. Also the temperature control following production process is very important in order to decrease the negative effects in metabolic activities. Other preventive measures involved in the reduction of the minimal processed horticultural products degradation are: the correct use of sharp knives and their cutting quality, the strict hygienic rules and effective washing and drying (removal of water excess quantity from the products surface).

This kind of products maintains a big part of the microflora after processing. A part of the microflora is represented by pathogenic microorganisms like *Listeria monocytogenes*,

Escherichia coli enterohemoragic, *Clostridium botulinum* and *Vibrio cholerae*.

One measure involved in keeping under control the growth of microorganisms regard the packaging of “ready to eat” horticultural products, under modified atmosphere. So, the level of O₂, reduced from 21% to 2-6% and CO₂ level increased from 0.03% to 3-8%; correlated with cooling and respecting hygiene results the respiration rate and microbial growth are reduced and the shelf life of the products is extended.

Starting from these aspects, in Table 1 the process step and related potential hazards are presented, including the preventive actions and the control measures, from which one of the most important is the temperature control.

Table 1. Hazard analysis regarding the processing of “fourth game” horticultural products

Process step	Hazard	Preventive actions/ Control measures
1. Receiving of raw materials	B- Pathogenic micro organisms C- Pesticides residues - Heavy metals - Fertilizers Ph - Foreign matter	Visual control Supplier assessment <i>Temperature control of the product</i>
2. Storage	B - Idem	Sanitation programme Regular maintenance FIFO system <i>Temperature control during storage</i>
3. Prewashing Preparation	B- idem Ph - Metal piece from cutting machine	Cleaning programme Right equipment Personal hygiene rules
4. Cutting	B - idem Ph - idem	Cleaning programme Right equipment Personal hygiene rules
5. Washing and disinfection	B - idem C - Disinfectant in excess Ph - Foreign bodies	Cleaning programme for equipment Control of the mechanism for removal of foreign matter; Personal training; <i>Disinfection to reduce microbial load</i>
6. Rinsing	B - idem Ph - Foreign bodies	Water specifications Control of the mechanism for removal of foreign matter Cleaning programme for equipment
7. Drying by centrifugation	B - idem	Regular maintenance of equipment Visual control Personnel training

8. Packaging (Metal detection)	B - idem Ph - Metallic foreign bodies C - Unacceptable substances from packaging materials	Cleaning programme for equipment Quality certificates of packaging materials; Personal hygiene rules Equipment maintenance <i>Removal of metallic objects by metal detector</i>
9. Labelling	B - idem	Visual control Personnel training
10. Storage	B - idem	Cleaning programme <i>Temperature control of the storage</i>
11. Distribution	B - idem	Right transportation vehicles Cleaning programme; Personnel training <i>Temperature control of transportation vehicle</i>

By using the CCP decision tree, in Table 2 the six CCPs identified are presented, out of which, five are focused to keep the microorganisms under control and one for the

metallic foreign bodies, although during the packaging process the cooling temperature has to be respected.

Table 2. CCP determination during processing of “fourth game” horticultural products

Process step	Hazard	Decision tree questions				CCP Nr.
		Q1	Q2	Q3	Q4	
1.Receiving of raw materials	B - Pathogenic organism	Yes	No	Yes	No	CCP1
2. Storage	B - idem	Yes	No	Yes	No	CCP2
3.Washing and disinfection	B - idem	Yes	Yes	-	-	CCP3
4. Packaging (Metal detection)	Ph - Metallic foreign body	Yes	Yes	-	-	CCP4
5. Storage	B - idem	Yes	No	Yes	No	CCP5
6. Distribution	B - idem	Yes	No	Yes	No	CCP6

The HACCP Plan (Table 3) is one of the most important documents from the food safety management system, which contains the main necessary information in order to implement the control measures and keep the identified CCPs under control.

As we know, the monitoring of finished food product is no guarantee of safety because unsafe samples may be not analysed. Because of that, the HACCP system is a structured approach to hazard identification, associated with the processing of “ready to eat” horticultural products.

Table 3. HACCP plan regarding the processing of “fourth game” horticultural products

Process Step	CCP Nr.	Critical limits	Monitoring process				Corrective action	Verification
			Responsible	Method	Frequency	Records		
Receiving of raw materials	CCP 1	Temperature products lower than 6°C	Warehouse supervisor	Products temperature control	Each receiving	Receiving sheet	Immediate cooling Return the nonconforming product to the supplier	Laboratory analysis of raw materials Vehicle recording paper
Storage	CCP 2	T <6°C UR = 95-100%	Warehouse supervisor	Visual control of temperature and relative humidity	Every 3 hours	Storage sheet	Adjustment of faults Hold nonconforming lots	Laboratory analysis of raw materials
Washing and disinfection	CCP 3	Water temperature 1-6°C Disinfectant conc. in water 90-100 ppm	Production supervisor	Temperature control and disinfectant conc. of washing water	Every product change and during washing	Liner washer sheet	Prewashing check and disinfection of nonconforming lots Adjustment of water temperature	Laboratory analysis of water and final products
Packaging (Metal detection)	CCP 4	Absence of metal objects >1 mm	Production supervisor	Operation control with metal tester with diameter <1mm	Every 3 hours	Packaging control sheet	Adjustment of metal detector Check suspicious products using another detector	Daily verification
Storage	CCP 5	Storage temperature lower than 6°C	Storage supervisor	Visual control of storage temperature	Every 3 hours	Storage sheet	Adjustment of faults Hold nonconforming lots	Laboratory analysis of final products – monthly
Distribution	CCP 6	Temperature during distribution lower than 8°C	Vehicle driver Quality supervisor	Control of temperature	At each loading and every hour during distribution	Loading control sheet Temperature recording during transport	Idem	Idem

CONCLUSIONS

The use of the adequate working techniques and hygiene programmes according to the HACCP principles assures the food safety of minimal processing (“ready to eat”) horticultural products.

Products that are safe for consumption can be obtained only by keeping the identified CCPs under control.

The temperature control of the process and the product are the main issues in order to assure the food safety of minimally processed (“ready to eat”) horticultural products.

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