APPLICATION OF HAZARD ANALYSIS AND CRITICAL CONTROL POINT (HACCP) IN READY-TO-EAT TAI PLA CURRY

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Abstract

Taipla curry is a southern traditional product of Thailand that is produced from fermented fish viscera and curry paste. This study applied food safety standard system in manufacturing process of one tambol one product (OTOP) ready-to-eat taipla curry in trang province. A number of three samples before and after the HACCP was implemented in process. The purpose of study was to examine the manufacturing process of ready-to-eat taipla curry with critical control points analysis and biological and chemical sanitary in food processing using HACCP in the process. Survey from the sanitary and production site, GMP, biological test results, food handler's hand and container are used as indicators. Pre-test and post–test HACCP results are measured to be compared. Two critical control point were identified by the used of CCP decision tree including mixing and cooking and drying step. The critical limit for mixing and cooking was cooking until a_w decrease below 0.80 and drying at 100 ºC for 4 hrs. The results showed that application of food safety management system led to a reduction in total viable count , total yeast and mold and a_w of product. The product had a shelf life of 33 days at ambient temperature.

Keywords : Tai pla curry, HACCP, fermented fish**,** traditional product

Introduction

HACCP has become synonymous with food safety (FAO/WHO, 2001.). It is a world wide recognized systematic and preventative approach that addresses biological, chemical and physical hazards through anticipation and prevention, rather than through end-product inspection and testing. The main stimulus for devising the HACCP system was the development of a preventive system for the production of food with a high degree of safety, which is extremely crucial in cases such as a space mission (FAO/WHO, 2001 : Pierson and Corlett,1992). Prior to application of HACCP, the production of Tai pla curry was in accordance with the Codex General Principles of Food Hygiene, the appropriate Codex Codes of practice and appropriate food safety legislation. Management commitment is necessary for implementation of an effective HACCP system.

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Methodology

The proper identification of CCPs is a key issue in HACCP, because the major efforts in process control will be directed towards these steps. Surface water is subject to a diversity of

pollutants and it is necessary to control the extent to which this occurs. For the practical application of the HACCP concept according to Codex Alimentarius (Pierson and Corlett, 1992). 7 rules have to be followed which are laid down in 7 main principles and constitute the basis for the establishment of a HACCP plan (FAO/WHO, 2006)

Principle 1: Perform a hazard analysis The objective of this step is to obtain a comprehensive list of all biological, chemical and physical agents or conditions which have the potential to cause harm, the assessment and the severity of the risk associated with these
hazards as well as the possible control measures for each hazard.

Principle 2: Determine the Critical Control Points (CCPs): Codex describes a CCP as: "A step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level. The intent of the HACCP system is to focus control at CCPs".

Principle 3: Establish one or several critical limit(s)

Principle 4: Establish a CCP monitoring system

Principle 5: Establish corrective action to be taken if monitoring indicates that a specific CCP is no longer under control

Principle 6: Establish procedures of verification to confirm a successful working of the HACCP system

Principle 7: Introduce a documentation system taking into account all processes and
records in accordance with the principles and their application Furthermore, there are 5 preparatory steps in the application of HACCP which are:

Step 1: the assembly of the HACCP team
Before setting up an effect HACCP plan, it was first to ensure that all relevant knowledge and expertise was available. The HACCP system mainly focuses on microbiological, chemical, physical and biological hazards, but expertise relating to the processes and process control plays an essential role in the sessions of the HACCP teams. Therefore, senior dietitians, managers and staffs who prepared and administered the Tai pla curry manufacturing were needed to setting up the HACCP system. These specialized persons and staffs make up the HACCP team.

Step 2: the description of the product (Table 2).

Step 3: Construction of flow chart of processing.
The HACCP processes should be systematic and successive, so flow chart was prepared including all relevant steps including acquisition of the raw materials, storage, mixing, cooking, drying package and so on (Fig. 1). Then, the accuracy of the flow chart should be verified by the HACCP team. If unanimity was attained by the HACCP team, the flow chart shouldn't be changed in later research.

Steps 4–5: Hazard analysis, determination of critical control points (CCP).
The application of preparatory activities and the principles of HACCP resulted in the HACCP plan, part of which, is described in Table 3. The CCPs are determined going through the decision tree of the method . The conceptual approach is shown in Fig. 2. Codex provides this decision tree to assist with a logical procedure for this but the use of this decision tree is not mandatory . The created HACCP plan (principles 1– 5) could be used as a supplementary system in the factory, if the treatment plant intends to implement.
HACCP as a working system. The HACCP plan includes the process steps of the treatment, the identified hazards, the preventative measures, the determined critical control points, a monitoring system, the critical limits of CCPs' monitoring parameters as well as the necessary corrective actions.

Sample collection

A sample were sampling for chemical and microbiological contaminate examination before and after implementation of the HACCP system in these three corporation which applied the HACCP system. All sample were placed in sterile bags and transported to the laboratory at low temperature and stored at 4 °C, until testing. All sample were analyzed within 24 h. after sampling. List of parameter show in table 1

Table 1 Quality analytical parameter and method

Quality analytical parameter	Method
Filth	AOAC, 2000
pH	AOAC, 2000
Water activity	Water activity meter : AquaLab
Total bacteria count	AOAC, 2000
Escherichia coli	AOAC, 2000
Staphylococcus aureus	AOAC, 2000
Clostridium perfringen	AOAC, 2000
Salmonella spp	AOAC, 2000
Aflatoxin	HPLC
Benzoic acid	HPLC

Resulted and discussion

A flow diagram of the Tai pla curry production was drawn up as depicted in Fig. 1 . At each step in the process, the potential hazard to product quality and the controls to prevent the hazard entering the product were identified. The overall process of Tai pla curry contained 6 steps. Then accuracy of the flow chart should be verified by the HACCP team. If unanimity was attained by the HACCP team, the flow chart should not be changed in later research. Understanding the potential pollution of Tai pla curry and manufacturing was essential for preparing and HACCP plan. Some pollution could be eliminated sufficiently in the operation, but others were not. Therefore, knowledge of possible microbiological , chemical, physical and biological hazard connected to the processes under evaluation was essential for the HACCP team . After identifying the hazards and the control measure which did or did not exit, we defined a step or procedure at which control can be applied and a food safety hazard can be prevented eliminated or reduced to acceptable levels. This step or procedure was critical control point (CCP). The selection of CCP_s was aided by the used of CCP decision tree (Fig.2) and table 3

Table 2 Product descriptive of Tai pla curry

Product name	Tai pla curry
Raw material	Fermented fish viscera and curry paste
Auxiliary material	Salt, monosodium glutamate , fish dried
Processing method	Cooking and drying
Product characteristic	Sensory index : product has a Hygienic index : Low water activity
Usage	Ready-to-eat
Production sites	One month with plastic box

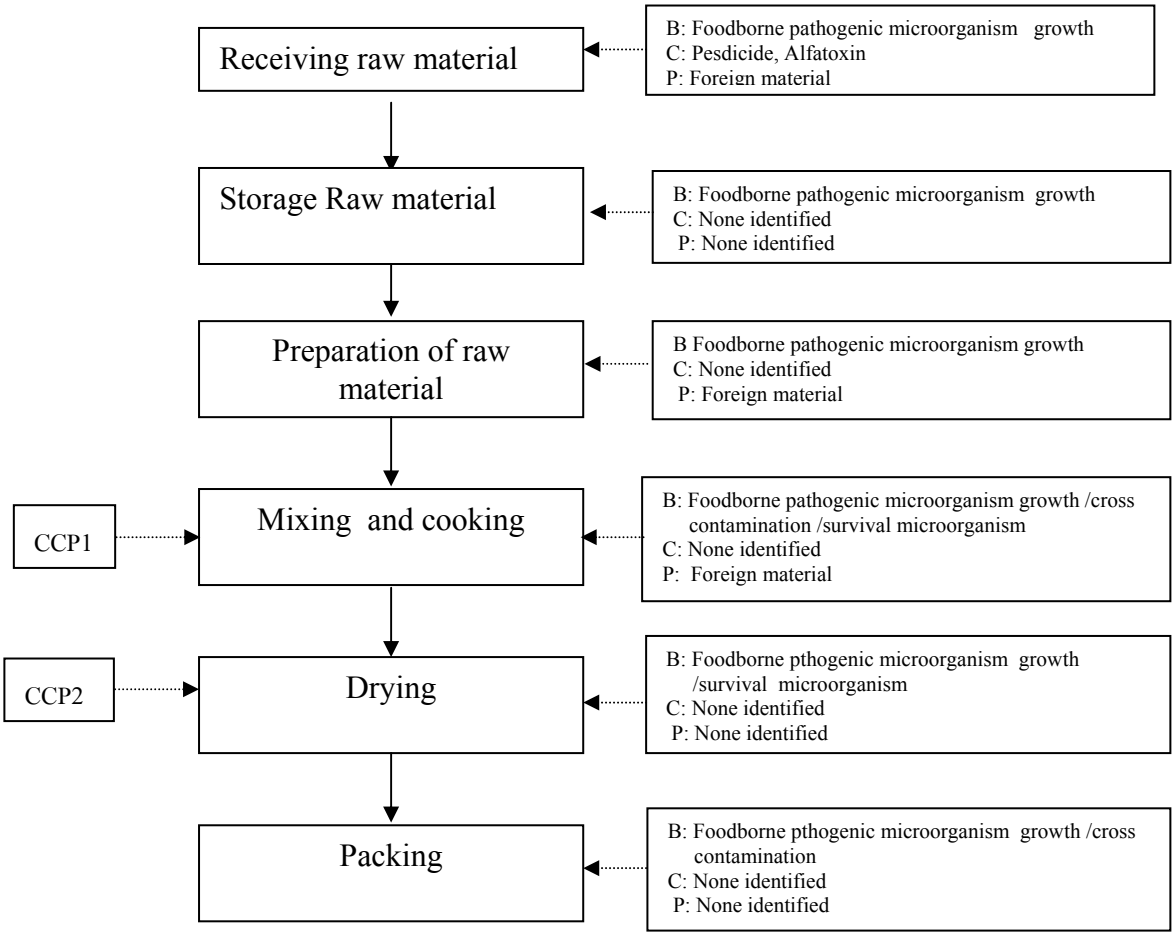

Figure 1 A common simplified flow diagram can be constructed for Tai pla curry

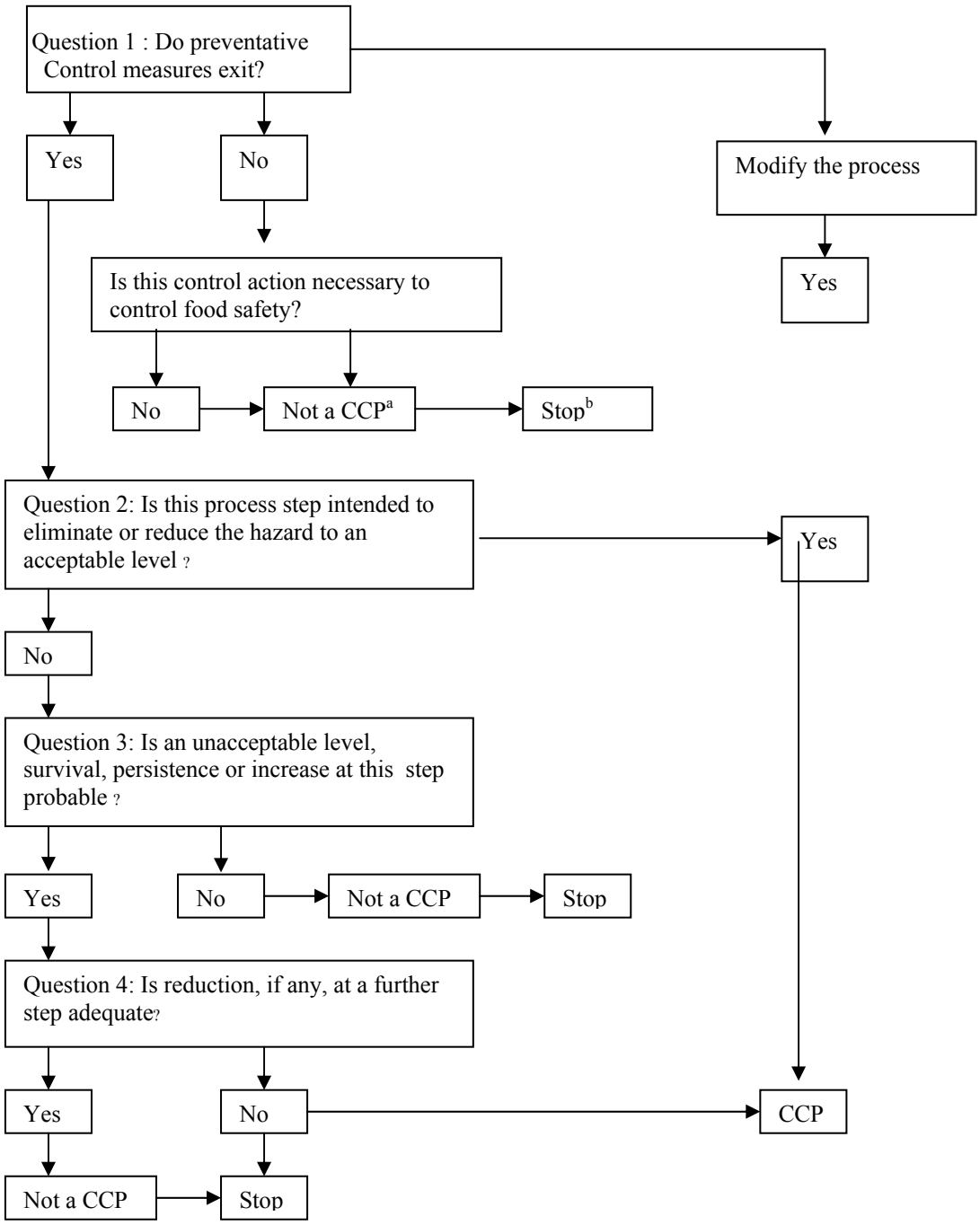

Figure 2 Four questions should be included in the CCP decision tree of the HACCP system.(Mortimore and Wallace, 1994).

Table 3 Decision of critical control point (CCP_s)

The processing step	The question of CCP decision tree				Whether CCP, or not	Main hazard
	Question 1	Question 2	Question 3	Question 4		
Receiving raw material	yes	no	yes	yes	not	
Storage	Yes	no	yes	yes	not	
Prepare the raw material	yes	no	yes	yes	not	
Mixing and Cooking	yes	yes	-	-	yes	Biological
Drying	yes	yes	-		yes	Biological
Packaging	yes	no	yes	yes	not	

A summary of CCPs was presented in table 3 . The selection of CCP was aided by the used of CCP decision showed that the CCP were mixing and cooking and drying step. Critical limit for mixing and cooking was cooking until a_w decrease below 0.80 and drying at 100 ºC for 4 hrs. Additionally, relevant hazards for CCPs, specifications, critical limits, monitoring methods and frequency, and or corrective actions of both processes were presented in table 4

Table 4 Identification and monitoring of important process (ranked as critical control points) phase in the Tai pla curry process.

The processing steps	Hazard	Specification /critical limit	Monitoring methods and frequency	Corrective action
Mixing and Cooking	Microbiological : Contamination and survival of pathogenic *Escherichai coli* *Staphylococcus aureus* *Clostridium botulinum* *Salmonella spp*	cooking until a_w decrease below 0.80	Every batch	Reprocessing
Drying	Microbiological : Contamination and survival of pathogenic *Escherichai coli* *Staphylococcus aureus* *Clostridium botulinum* *Salmonella spp*	drying at minimum temperature at 100 ◦C for 4 hrs.	Every batch	Reprocessing

Table 5 Pre-test and post –test HACCP in Tai pla curry process

Quality	Pre-test	Post-test	Thai Community Product Standard : Dried Tai pla curry
Total variable count	$6.50x10^4$	<30	$<1 \times 10^4$ cfu/g
Salmonella sp	ND	ND	ND /25 g.
Staphylococcus aureus	ND	ND	<100 colony/ g.
Clostridium perfringens	ND	ND	ND /0.01 g.
E. coli	> 3 MPN	<3 MPN	< 3 MPN/ g.
Yeast and mold	<100	ND	< 100 cfu/g
Benzoic acid	ND	ND	Not exceed 1,000 mg/kg
Alflatoxin	5.00	ND	Not exceed 20 microgram/kg
Filth	ND	ND	Non detect adulterated thing, be not the ingredient of products

ND : not detect

Discussion and Conclusion

The advantage of HACCP focuses on identifying and preventing hazards from contaminating food. The results clearly indicate that the Tai pla curry produced by implementing HACCP procedures were of better quality when compared to the traditionally prepared ones. This is mainly due to the adoption of good manufacturing practices, good food hygiene practices and standard operating procedures. The HACCP protocols thus control every stage of processing and yield a better quality and safety product which was missing in the traditional processing. These results indicate the importance of the HACCP for producing safety and quality Tai pla curry. HACCP procedures were developed for making Tai pla curry with utmost quality and safety for consumption. This will enhance their export potential through meeting international standards.

References

1. AOAC. 2000. Official Methods of Analysis. 16th eds. Arlington, VA, Association of Official Analytical Chemists.
2. FAO/WHO, 2001. Codex Alimentarius, Food Hygiene-Basic texts, Second Edition, FAO/WHO Rome, Italy.
3. FAO/WHO, 2006. FAO/WHO guidance to governments on the application of HACCP in small and /or less developed food businesses, Food and Nutrition paper 86, FAO/WHO Rome, Italy.
4. FAO/WHO, 2001. Codex Alimentarius, Food Hygiene-Basic texts, Second Edition, FAO/WHO Rome, Italy.
5. Mortimore, S., and Wallace, C. (1994). HACCP: A practical approach. London: Chapman & Hall.
6. Pierson, M. D. and Corlett, D.A. (1992). HACCP. Principles and Applications. Chapman and Hall, New York.