GSJ: Volume 8, Issue 1, January 2020
ISSN 2320-9186

GSJ: Volume 8, Issue 1, January 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

HAZARD ANALYSIS AND CRITICAL CONTROL POINT ON HANDLING WGGS RED TILAPIA AT KURNIA MITRA MAKMUR PURWAKARTA LTD, WEST JAVA

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ABSTRACT

The research was conducted at Kurnia Mitra Makmur Purwakarta Ltd. West Java from July until November 2019. The research aims to identify the hazards and determine the points of critical control of the handling process of WGGS Red Tilapia. The research is done by case study method. The research procedures include observing the flow of WGGS Red Tilapia handling process, potential hazard analysis, identification of critical control points, microbiological test and an organoleptic test. The data was analyzed descritptively. The possible hazards of WGGS Red Tilapia handling process are biological, physical, and chemical hazards. Based on hazard analysis, the critical control points are the stage of washing II. The microbiological test results for the final product of WGGS Red Tilapia is still meet quality standards. WGGS red tilapia products are acceptable and safe for public consumption. The microbiological test results on raw materials and final products estimate the amount of *Salmonella* sp. and *Vibrio cholera* which is negative/25 g, *Escherichia coli* <1.8 MPN / g, ALT on raw materials 3.6 x 102 and on the final product 4.0 x 101. WGGS red tilapia products are acceptable and safe for public use. The organoleptic test results of the raw material that have been compared with the SNI 2729: 2013 scale as a whole are categorized as acceptable with raw materials that can be used for further processing.

Keyword : Hazard Analysis, Identification of Critical Control Point, Mikrobiological, Organoleptic, WGGS Red Tilapia

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ISSN 2320-9186

Introduction

Red tilapia is one type of potential freshwater fish for animal protein sources that are popular and can be reached by various levels of society. Red tilapia has thick flesh, white, neutral-smelling, compact, spines that are easily separated from the bones and high protein (Sahlan *et al* 2018). Red tilapia is also one of the aquaculture commodities that has high economic value and potential with a wide open market share (Mansyur and Mangampa 2011).

The development of red tilapia fishery products needs to be done because most of the results of red tilapia aquaculture are only sold in fresh form. WGGS (whole, gilled, gutted, and scaled) is one form of diversification of red tilapia products. WGGS red tilapia uses fresh and intact fish raw materials. Raw materials made from fish are very perishable compared to other food commodities (Pratama 2013).

In connection with the above, it is necessary to implement a quality control system to ensure the safety of products produced by the fishery products industry, food processing companies are encouraged to apply the Hazard Analysis Control Point (HACCP). The HACCP system must be based on GMP (Good Manufacturing Practices) and the application of SSOP (Standard Sanitation Operating Procedure). The HACCP security system is needed to guarantee the product is safe from potential hazards. HACCP includes hazard analysis and control of critical points to ensure products consumed are safe from physical, chemical and microbiological hazards (Dewi 2015).

The process of handling WGGS red tilapia carried out by Kurnia Mitra Makmur Purwakarta Ltd. has not implemented HACCP that conforms to the standard and is only equipped with Halal certificates, SKP (Certificate of Feasibility Processing), and GMP. Therefore, research is carried out to analyze the hazard and critical control points on handling WGGS red tilapia.

Research Methods

The research was carried out in July-November 2019 at Kurnia Mitra Makmur Purwakarta Ltd., Westjava. The method used in this research is the case study method. Case studies are research that emphasizes a deeper understanding of certain phenomena. Case studies are also useful in exploring problems that are not yet known about certain phenomena (Yona 2006). Retrieval of data through active participation and interviews. Active participation means participating in part or all of the activities directly in process flow in a production unit (Nento 2015). Interviews are a way of collecting data using question and answer unilaterally carried out systematically and based on research objectives (Marzuki 1986 in Nento 2015).

The research procedure was carried out by following the path of the process of processing the catfish filet, from receiving raw materials to filet products which were then analyzed the potential hazards and identification of critical control points, microbiological and organoleptic testing and comparing the results of microbiological testing with SNI 2332 in 2006 and 2015 and organoleptics with SNI 2729 of 2013 concerning fresh fish.

Result

Table 1. Product Description WGGS Red Tilapia at Kurnia Mitra Makmur Purwakarta Ltd.

No	Description	Information
1	Product name	WGGS (Whole, Gilled, Gutted, Scaled) Red Tialpia
2	Spesies name	Oreochromis niloticus
3	Raw material	Aquaculture in Jatiluhur, Cirata, and Indramayu
4	Receiving raw material	Raw material was receiving from supplier using drum plastic The temperature maintaine 5^0C
5	Finish Product	Whole frozen
6	Raw material	Main material: red tilapia fresh Auxiliary materials : water and ice
7	Processing step	Recieving, Sorting, Weighing I, Scalling, Gilling, Gutting, Washing I, Weighing II, Washing II, Layering, Freezing I, Glazing, Freezing II, Final Weighing, Packing and Labeling, Storing, Stuffing
8	Packaging	Red tilapia WGGS is packed in plastic 50 x 80 x 0,03 cm then packed again in master carton 55,2 x 35,3 x 10,8 cm and plastic bag 58 x 48 x 0,05 cm.
9	Packing material	- Inner package : Plastik polyethylene - Outer package :Master carton and plastic bag
10	Storage conditions	Storage in frozen cold storage central temperature – 20^0C with fluctuation 2ºC
11	Labeling	Production code, name of product, quantity, date of production, name of supplier, GMP code, Halal code.
12	Shelf life	18 months in frozen condition
13	Storage instruction	Keep frozen at -18^{o}C

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No	Description	Information
14	Instriuction for use	Cooked before consumtion
15	Intended costumer	General public

Physical, Biological and Chemical Hazard Analysis

Hazard analysis begins by tracing the factors that cause hazard in each process of handling WGGS red tilapia. The hazards that have been identified are then classified according to their biological, chemical and physical characteristics. These hazards are analyzed to find out whether or not they can be controlled by GMP and SSOP if they cannot be controlled, it is necessary to control efforts..

Table 2. Hazard Analysis of WGGS Red Tilapia Product

No	Process	Hazard Potential	Hazard Source	Prob (L/M/H)	Sev (L/M/H)	Sign (S/NS)	Precaution
1.	Receiving Raw Material	Biological	Contamination from workers, equipment and raw materials	L	H	NS	- Can be controlled with SSOP for workers and equipment -Microbiological test results of raw materials from suppliers
		Chemical	Water pollution from fish suppliers	L	M	NS	Water chemistry test results from suppliers
		Physical	Contamination from suppliers when harvesting fish and transportation	L	L	NS	Can be controlled with GMP and SSOP
2.	Sorting	Biological	Contamination from workers and equipment, increased temperature	L	H	NS	Can be controlled with SSOP and GMP by ensuring clean equipment and workers and cold chain application
3.	Weighing I	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP by maintaining and supervising worker and equipment hygiene
4.	Scalling	Biological	Contamination from workers and equipment, increased temperature	L	H	NS	Can be controlled with SSOP
		Chemical	Contamination from rusty material	L	H	NS	- Can be controlled with GMP and SSOP - Do not use rusty tools and clean the equipment properly
		Physical	Remaining scales	L	L	NS	Can be controlled by GMP and SSOP
5.	Gilling	Biological	Contamination from workers and equipment, increased temperature	L	H	NS	Can be controlled by GMP and SSOP
		Physical	Remaining gills	L	L	NS	Can be controlled by GMP
6.	Gutting	Biological	Contamination from workers and equipment, increased temperature	L	H	NS	Can be controlled with SSOP for workers and equipment and GMP by adding ice
		Physical	Remaining gutted	L	L	NS	Can still be overcome with GMP by removing the remaining gutted regularly
7.	Washing I	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP that is controlling water quality, worker hygiene, and equipment used
		Physical	Remaining scales, gills and gutted	M	L	NS	- Can be controlled by GMP and SSOP

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GSJ: Volume 8, Issue 1, January 2020
ISSN 2320-9186

No	Process	Hazard Potential	Hazard Source	Prob (L/M/H)	Sev (L/M/H)	Sign (S/NS)	Precaution
							- The water used should be cold water in a flowing state
8.	Weighing II	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP by maintaining and supervising worker and equipment hygiene
9.	Washing II	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP by maintaining and supervising worker and equipment hygiene
		Chemical	Chlorine levels are not according to the regulations	H	H	S	Adjustment of chlorine levels with applicable regulations
10.	Layering	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP in washing layers correctly and correctly
11.	Freezing I	Biological	Contamination from workers and equipment	L	H	NS	-Can be controlled with GMP -Keep freezing temperatures low
12.	Glazing	Biological	Contamination from workers and equipment	L	H	NS	Can be controlled with SSOP and GMP
		Physical	The process of removing layers on the product is not correct	M	M	NS	Can be controlled with SSOP and GMP
13.	Freezing II	Biological	Contamination from workers and equipment	L	M	NS	-Can be controlled with GMP -Keep freezing temperatures low
14.	Final Weighing	Biological	Contamination from workers and equipment	L	M	NS	Can be controlled with SSOP
		Physical	The process of removing layers on the product is not correct	M	M	NS	Can be controlled by removing layers manually
15.	Packaging and Labeling	Biological	Contamination from workers and equipment	L	M	NS	Can be controlled with SSOP
16.	Storing in cold storage room	Biological	Contamination from workers and equipment	L	L	NS	-Can be controlled with GMP -Keep freezing temperatures low
17.	Stuffing	Biological	Contamination from workers and equipment	L	M	NS	Can be controlled with SSOP

Determination of Critical Control Points

Table 3. Identification of CCP on WGGS Red Tilapia Product

Process	Significant Hazard	Identification of the CCP				
		Q1	Q2	Q3	Q4	CCP
Washing II	Use of high chlorine levels	Yes	No	Yes	No	CCP

Hazards that have been identified previously indicate potential hazards that are significant. Based on the significant hazards then analyzed to determine the critical control points. Determination of critical control points in the HACCP system can be facilitated by the application of decision trees, which show a logical approach to thinking (Domenech *et al* 2008). The determination of CCP in the process of handling WGGS red tilapia in the company is based on a decision tree according to the second principle in the HACCP system. The use of this diagram carries a structured analytical mindset and guarantees a consistent approach to each identified hazard (CAC 2003). Based on identification using a decision tree, it was found that the critical control points in the washing stage II.

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The step of washing II that needs to be monitored is the chemical hazards of using chlorine. At this stage, the use of 30 ppm chlorine is 9 ml. According to the Decree of the Minister of Maritime Affairs and Fisheries No. KEP / 01 / MEN / 2002, water used in washing fish can be added to chlorine at levels not exceeding 10 ppm. This is also in line with the provisions of SNI 7143: 2013 (BSN 2013), rinsing tilapia with cold water and can contain a maximum of 10 mg / kg of chlorine if needed while maintaining a cold chain (0ºC - 5ºC). According to the research of Reilly (2000) in Rohmah and Sulistyorini (2017), shrimp soaked in chlorine by 150 mg / l HOCL (equivalent to 87 ppm free chlorine) for 30 minutes can absorb about 2% of chlorine added to shrimp where 75% are in the edible part. Health problems that occur can be in the form of poisoning and health complaints (RI Ministry of Health 2012). The use of chlorine in food can cause both short and long term disturbances especially in the gastrointestinal tract (Rohmah and Sulostyorini 2016).

Microbiology Test

Microbiological testing of raw materials and final product of WGGS red tilapia at Kurnia Mitra Makmur Purwakarta Ltd. is carried out by Saraswati Indo Genetech Bogor Ltd. Microbiological testing is carried out to determine the content of *Salmonella* sp., *Escheria coli*, *Vibrio cholerae* and ALT. The method used for testing *Salmonella* sp. and *Vibrio cholerae* referring to SNI 2332: 2006, testing of *Escherichia coli* and ALT refers to SNI 2332: 2015. Microbial observations were made on the raw material and final product of WGGS red tilapia.

Table 4. Microbiology Test Results of WGGS Red Tilapia

No	Parameter	Unit	Product		Quality Standards
			Raw Material	Final Product	
1.	*Salmonella*	/25g	Negatif	Negatif	Negatif
2.	*Vibrio Cholera*	/25g	Negatif	Negatif	Negatif
3.	*E.coli*	MPN/g	<1,8	<1,8	<3
4.	ALT	Colony/g	$3{,}6 \times 10^2$	$4{,}0 \times 10^1$	$1{,}0 \times 10^5$

Based on Table 4, microbes found in raw materials and final products still meet quality standards. The quality standard refers to SNI 2332 of 2006 and 2015 concerning the method of microbiology testing on fishery products. Salmonella sp. Test results and Vibrio cholerae on raw materials and negative final products / 25 g. This is in accordance with the quality standards for testing Salmonella sp. and Vibrio cholerae which is negative / 25 g. Escherichia coli test results on raw materials and final products <1.8 MPN / g. This is still below the quality requirements of <3 APM / g. ALT test results on raw materials 3.6 x 102 and on the final product 4.0 x 101. This is still below the ALT quality requirements of 1.0 x 105. Bacteria Escherichia coli, Salmonella, and Vibrio cholera are included in bacteria with a degree of fear high danger that can threaten human lives. This is because Escherichia coli (> 105 cells / g) can cause mild to acute diarrhea and dysentery; Salmonella (> 103 cells / g) can cause diarrhea, fever, stomach cramps, vomiting; Vibrio cholerae (106 - 108 cells / g) can cause diarrhea, stomach cramps, dehydration, and salt imbalance (Sadek 2010).

Microbiology test results indicate that the application of HACCP in Kurnia Mitra Makmur Purwakarta Ltd. is categorized quite well with the results of microbiological testing under the quality standard and WGGS red tilapia products are suitable for consumption.

Organoleptic Test

According to Patang (2014), organoleptic testing is a way of assessment using only the human senses (sensory). This method is very fast, easy, and practical to do, but its accuracy depends on the level of intelligence of the person who carries it out (Septiarini 2008).

Organoleptic testing is carried out at the stage of receiving raw materials, samples in the form of whole red tilapia received from suppliers. Organoleptic testing is done by individual panels. According to Rogers (2018), the individual panels are highly skilled, highly trained, have very high specific sensitivity and are very experienced. The individual panel was very familiar with the nature, role and method of processing the material to be assessed and mastered the methods of organoleptic analysis very well. The individual panel of organoleptic testing of raw materials is one person QC staff. Organoleptic test results are recorded in the receiving control form. Organoleptic test of raw materials is done by taking a sample of 10 fish. The parameters observed were aroma, elasticity and physical (eyes, gills, mucous layer, odor, and stomach contents). Organoleptic assessment refers to the company standard table of Kurnia Mitra Makmur Purwakarta Ltd.

Table 5. Organoleptic Test Results of WGGS Red Tilapia Product

Sample	Temperature (^{O}C)	Scents	Elasticity	Physical
1	9,2	2	2	2
2	9,3	2	2	2
3	9,3	2	2	2

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4	8,4	2	2	2
5	6,2	2	2	2
6	9,6	2	2	2
7	12,4	2	2	2
8	8,8	2	2	2
9	8,9	2	2	2
10	8,9	2	2	2
	Good	Good	Good	Good

Based on Table 5, it was found that scents of red tilapia raw material has a value of 2, which means red tilapia has a somewhat lost fresh smell. Based on SNI 2729: 2013 (BSN 2013) the value of raw materials used by Kurnia Mitra Makmur Purwakarta Ltd. is equivalent to a value of 7, namely fresh, less specific species.

The elasticity parameter of red tilapia used as raw material has a value of 2 which means it is rather dense / soft. Based on SNI 2729: 2013 (BSN 2013) the value is equivalent to value 7 which is rather soft, somewhat elastic.

Physical parameters of red tilapia as raw material have a value of 2 on the specifications of the eyes, gills, body surface mucus, fish flesh & stomach. The eyes of red tilapia raw materials have a value of 2, which means bright, flat, clear eyes. Based on SNI 2729: 2013 (BSN 2013) is equivalent to a value of 7 in the specification of the appearance of the eyes, that is, flat eyeballs, slightly cloudy corneas, slightly grayish pupils. Gills have a value of 2 which means the red gills are less brilliant, without mucus. This value is equivalent to the value of 8 in SNI 2729: 2013 (BSN 2013), namely the color of dark red or reddish brown gills, less brilliant with a little transparent mucus. The assessment of body surface mucus layer has a value of 2 which means the body surface mucus layer begins to become cloudy, slightly milky white, rather gloomy. This value is equivalent to the value of 6 in SNI 2729: 2013 (BSN 2013), ie the slime layer starts to become turbid. Meat & stomach has a value of 2 which means the smell of neutral stomach contents. Assessment of meat and stomach cannot be compared because the assessment of meat is only at 0-1 while the value of 2-3 is only the assessment of stomach contents in the standard table of Kurnia Mitra Makmur Purwakarta Ltd.

The organoleptic test results of the raw materials as a whole are categorized as acceptable and then continued for the next process. This is based on the parameters tested in the form of aroma, elasticity, and physical having a score of above 3 based on SNI 2729: 2013 rating scale. According to Sufianto (2004) fish are organoleptically rejected or considered not fresh if they have 1-3 test values. The evaluation of organoleptic test results needs to be compared with the assessment scale of SNI 2729: 2013 because the company standard evaluation table still has shortcomings, namely the parameters assessed are still unclear and specific, so there is a need for improvements that refer to the SNI assessment.

Conclusion

Based on the results of research conducted on the handling unit of WGGS red tilapia (Whole, Gilled, Gutted, Scalled) at PT. Kurnia Mitra Makmur Purwakarta, it can be concluded that:

1) Research results show the process of handling WGGS red tilapia at PT. Kurnia Mitra Makmur Purwakarta has not implemented the HACCP system properly based on SNI 01-4851-1998. This shows that each handling process is not in accordance with GMP (Good Manufacturing Practice) and SSOP (Sanitation Standard Operating Procedure). Based on the identification results, the critical control point (CCP) was found at the step of washing II.
2) The results of microbiological testing of raw materials and final products in the handling of WGGS red tilapia still meet quality standards. WGGS red tilapia products are acceptable and safe for public consumption.
3) The organoleptic test results of the raw material that have been compared with the SNI 2729: 2013 scale as a whole are categorized as acceptable with raw materials that can be used for further processing.

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