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Fish Fillet Catfish Processing Technology from Central Kalimantan, Indonesia

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Abstract: *Catfish is one of the freshwater fish that belongs to the family pangasidae and known locally catfish, jambal or pangasius. Catfish is a fish consumption, long-bodied white with silver-colored with bluish-colored in spine. Catfish meat has calories and high protein,typical meat flavor, tasty, delicious and savory. Catfish is considered to be safer for health because of the lower cholesterol levels compared to the meat of cattle. The fish are usually found in large rivers, this kind is relatively large and until recently was known about 13 species. In English language, the fish are called with catfish because the fish have a "mustache", same as cats.From a wide range of fishery products, fish fillet is a popular one. Not only the direct consumption, fish fillets are also widely used as an industrial raw material in fishery processing products, such as fish meatballs, fish otak-otak, fish crackers, fish tempura, fish snails, fish kaki naga, fish nuggets, and so on.*
Keywords:*Catfish (Pangasius sp), fish fillet*

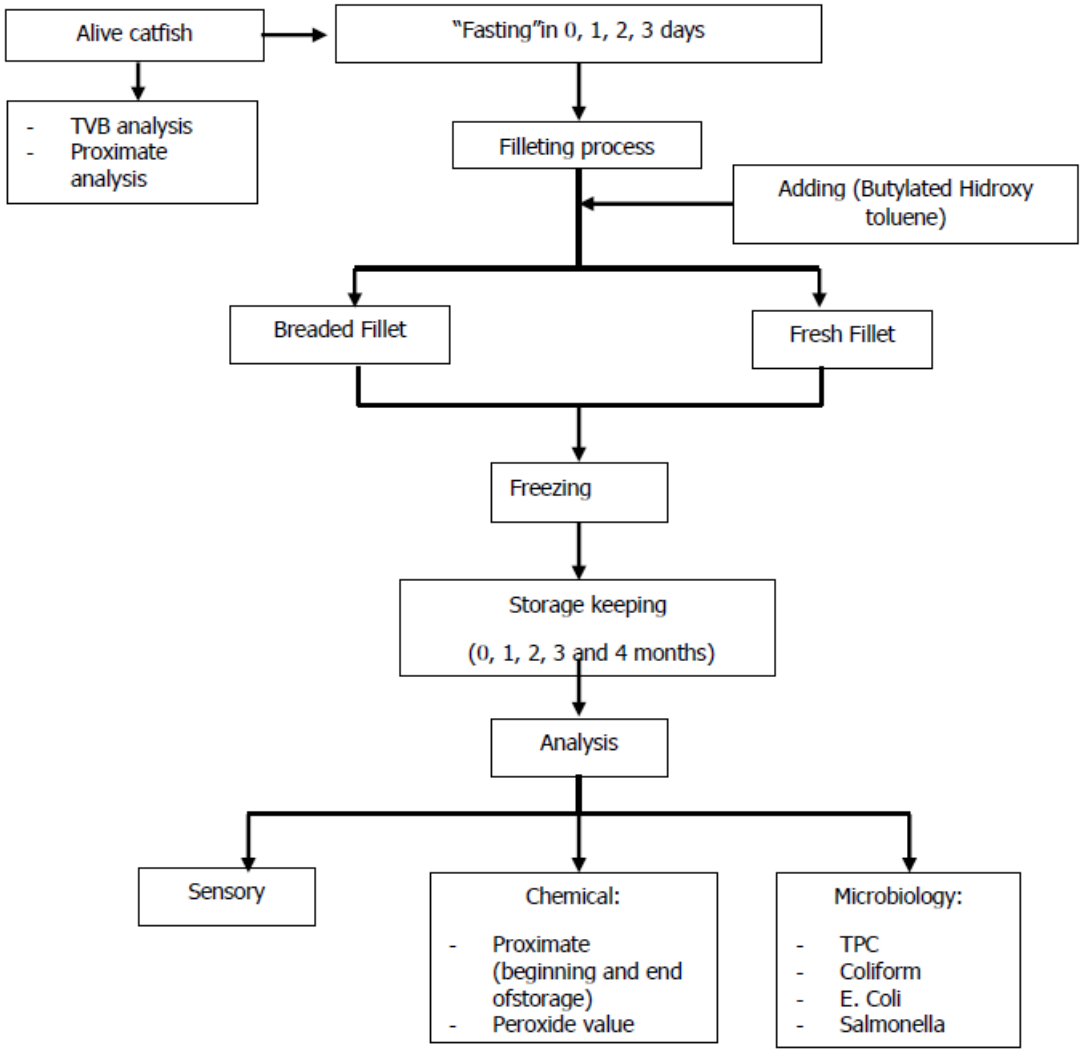
I. Introduction

Catfish (Pangasius sp) still have an alliance with conjoined jambal fish (Pangasius sp) that developed and spread in Southeast Asia. In biological classification, including the order Ostariophysi catfish, Familia Pangasidae and genus Pangasius (Djarijah, 2001). Jambal Catfish (Pangasius sp) belongs to the group of large Catfish, where Pangasius group is composed of 19 species that spread from mainland India, Indochina, Burma, Malaysia and Indonesia (Robert & Vidyahayanon, 1991).

Patin jambal is one of a group of pangasius, that are numerous in rivers, lakes and other public waters in Indonesia and many have encountered in Jambi, Riau and South Sumatra. From the results of the evaluation in the field showed that this fish has a favorable character for cultivation and can reach greater sizes than 20 kg body weight (Legendree et al, 2000) but the availability is still dependent on catches in nature. With the success of Freshwater Aquaculture Center Jambi in seed mass production since 2002, then open magnifying business opportunities. So the jambal catfish aquaculture can be used as an alternative freshwater commodity in the future.Catfish is one of the featured freshwater fish and already began to be cultivated on a large scale to meet the needs of both local and export. Catfish for export are usually processed in the form of fillets, both "frozen fillet" and "breaded fillet". The main problem encountered in the processing of catfish fillets are mud smelled, "drip loss" and "oxidative rancidity" followed by fillet color changes to yellow. Some technical issues are critical in the development of research on this catfish. Quality and food safety cannot be separated when talking about fishery products. It is based on the fact that fish including food products are highly perishable (perishable food), so that the efforts to maintain the quality and safety into things that must be considered. Food such as fish and products required to meet the provisions prior to consumption (Purnomo, 2007). Justification of quality assurance and safety of fishery products in order to respond to increasing consumer demand today as a consequence of the increasing world civilization (Rokhman, 2008). In relation to free trade, the establishment of quality assurance and food safety of fishery products will improve the competitiveness of Indonesian fishery products in the global market.

II. Materials And Methods

Procedure processing technology development research catfish fillets shown schematically below. Pre-study includes "fasting"in alive catfish to get the best results are then applied to further research.



III. Observations

Water content (AOAC, 1995)

Porcelain cup dried at 105°C for 1 hour. Then cooled and weighed, samples of which will be determined water content was weighed as much as 2 grams. Plates were contains a sample put in an oven at 105°C until its weight is constant. The water content was calculated by the formula.

$$\text{Water content (\%)} = \frac{(B - A)}{\text{sample weight}} \text{ x } 100\%$$

Description:
A = weight of dry sample cup + (g)
B = weight of dish + wet sample (g)

Abu levels (AOAC, 1995)

Examples that have evaporated the water put into the furnace temperature 600°C, previously dried and cup heavy weight has been known samples. Evaporation process is carried out until all the materials change color to gray, then the sample is weighed. The ash content was calculated by the formula:

$$\text{Ash content (\%)} = \frac{ash\ weight}{sample\ weight} \text{ x } 100\%$$

Protein levels (AOAC, 1995)

0,02 to 0,05 grams of sample included in the 100 ml Kjeldahl flask then add 2-3 grams of catalyst (1.2 g Na2SO4 and 1 gram of CuSO4) and 2-3 ml of concentrated H2SO4 , then do destruction until the solution became clear. After it is cooled and then the sample was distilled and added 35 ml of distilled water and 10 ml of 50 % NaOH. Distilled accommodated in 5 ml Erlenmeyer containing H3BO3 and indicator methyl red and blue methyl then titrated with 0.02N HCl. The protein content was calculated by the formula:

$$\text{Kadar nitrogen}(\%) = \frac{(ml\ \text{HCl} - \text{ml blanko})\ \text{x normality HCl x } 14.007}{\text{mg sample}}\ \text{x } 100\%$$

Crude protein (%) = nitrogen value x 5.46 (Leach dan Eastoe, 1977)

Fat Content (Apriyanto et al., 1989)

A total of 2 grams of sample wrapped in filter paper and put in a Soxhlet flask (flask previously dried in an oven, put in a desiccator and weighed). Entered petroleum ether solvent then carried reflux for 6 hours. Then the flask containing reflux results in an oven heated to a temperature of 105°C. After it is cooled in a desiccator and weighed. Fat content was calculated by the formula:

$$\text{Fat content (\%)} = \frac{\text{fat weight}}{\textit{sample height}}\ \text{x } 100\%$$

Total Microbe (total aerobic plate count) (SNI 01-2339-1991)

A total of 10 grams of sample suspended in 90 ml of 0.85 % NaCl solution. To calculate the number of microbes that exist in the sample, carried out by the method of fertilization in order to cast. A total of 1 ml sample was diluted put into a sterile petri dish and pour the media so that the PCA ±15 ml (temperature 44-46°C), then shaken horizontally so that the sample is spread evenly. After that freezes, do incubation with inverted position at 37°C temperature for 48 hours. Colonies that grew calculated and reported as the number of colonies per gram according to the Standard Plate Count.

Test Escherichia coli (SNI 01-2332-1991)

Qualitative test E. coli carried through the test probe and test the amplifier. Test probe done by inoculating the sample into a test tube containing the LST (Lauryl Sulfate Broth Triptose) and Durham tube, then incubated at 37°C for 24-48 hours. Probe test is positive if the gas is formed as much as 10 % or more of the volume in the Durham tube. Amplifier test done by scraping the suspension of positive Durham tube in the cup EMBA. Incubation for 24 hours at a temperature of 37°C. Growth of E. coli colonies are marked with a green metallic color above the EMBA.

Determination of Salmonella (ISO 01-2335, 1991)

A total of 10 grams of sample is introduced into a blender jars and add 90 ml of lactose broth, then blend for a few seconds at a low speed and continued at high speed for two minutes. Samples were aseptically transferred into a sterile bottle lids. Sample was added into a solution of 1 N NaOH to achieve a pH of 7, and then incubated at 35°C for 24 hours. After incubation the sample bottle was shaken slowly then taken 1 ml and transferred to a test tube containing 10 ml of medium Selenite Cystine Broth (SCB). Subsequently incubated at 35°C for 24 hours. Completed incubation, grown on three kinds of media, namely Bismuth Sulphite Agar (BSA), Salmonella-Shiggella order (SSA), and Brilliant Green Agar (BGA), by means of scratches. Then incubated at 35°C for 24 hours. After incubation, the observed presence of Salmonella colonies with the following characteristics: the media BGA, colorless, pink, unclear or blurred with the surrounding medium pink to red color; in SSA, colorless, pale pink, clear, blur, there is a black spot in the center of the cell; the BSA, brown, black and sometimes gave a light metallic, medium brown around the first turn black with the increasing length of incubation, green colonies with little or no occurrence of a dark color around the media. When the gelatin is not found colonies suspect then incubated for 24 hours back.

Each suspect Salmonella colonies were transferred to slant agar Triple Sugar Iron Agar (TSIA) by scratching it, then incubated at 35°C for 24 hours. TSIA who suspects overgrown with Salmonella will show the formation of red color with or without the onset of H2S black color.

IV. Results And Discussion

The pre-research showed that 1 day of "fasting" in catfish is the best result that will be used in further research. Proximate results of catfish are as follows:

Sample	Water Content (%)	Ash Content (%)	Protein Content (%)	Fat Content (%)
Without "fasting" (control)	77.99	1.03	19.02	1.56
1 day of "fasting"	72.47	0.76	19.81	6.79
2 days of "fasting"	67.61	0.96	21.25	10.0
3 days of "fasting"	67.94	0.53	21.21	8.89

However, further research of catfish fillets include processing technology that produces breaded fillets and fresh fillets. Request buyers in general are pangasius fillet with white flesh color, it is rather difficult for exporters because of the availability of abundant catfish has yellow flesh color. Breaded products is one solution to cover the meat color yellow catfish fillets , where the addition of bread crumb on the fillet is expected to cover the yellowish color of the meat fillets . Another issue that arises is the possibility of considering the high rate of oxidation of fatty fish catfish is high, so that in this study, the addition of BHT antioxidant to inhibit the oxidation reaction on the product during frozen storage.

Procedures performed are as follows:
- Fresh Catfish fillets in cold conditions
- Fillet of catfish in less skin (skin removed) and in trimming
- Fillet of catfish in antioxidant BHT soak in the treatment 0; 0,02; 0,04; 0,06 and 0,10 % for 10 minutes.
- Fillet of catfish then drained and packed in plastic vacuum.
- For product breaded catfish fillets, fillet dipped in batter and then coat with bread crumb in.
- The fillet that has been breaded then packed in plastic vacuum.
- Catfish fillets that have been packaged frozen and then stored in cold storage for 4 months.

The yield of catfish fillets shown in Table 1 below:

Table 1. The yield of catfish fillets

Weight (gr)				Yield to Whole		
Whole	Fillet		after	Fillet		after
	Skin-On	Skinless	trimming	Skin-On	Skinless	Trimming
440	220	160	140	50.00%	36.36%	31.82%
580	300	200	120	51.72%	34.48%	20.69%
380	160	140	100	42.11%	36.84%	26.32%
510	240	220	200	47.06%	43.14%	39.22%
600	320	260	200	53.33%	43.33%	33.33%
380	160	160	150	42.11%	42.11%	39.47%
320	160	100	100	50.00%	31.25%	31.25%
510	320	240	200	62.75%	47.06%	39.22%
340	140	130	120	41.18%	38.24%	35.29%
700	280	230	210	40.00%	32.86%	30.00%
500	240	200	160	48.00%	40.00%	32.00%
420	220	210	160	52.38%	50.00%	38.10%
360	150	140	110	41.67%	38.89%	30.56%
480	220	200	190	45.83%	41.67%	39.58%
400	180	170	150	45.00%	42.50%	37.50%
480	240	200	170	50.00%	41.67%	35.42%
430	220	190	160	51.16%	44.19%	37.21%
660	240	200	190	36.36%	30.30%	28.79%
480	180	160	140	37.50%	33.33%	29.17%
448.5	**209.5**	**175.5**	**148.5**	**44.41%**	**37.41%**	**31.75%**

The process of catfish fillets did not experience problems due to relatively large fish weight (±500 g) and not scattered but are along the spine of fish. In Table 1 it appears that the yield of pangasius fillet skin -on is 44.41 %, 37.41 % less skin while after fireplace (trimming) approximately 31.75 %.

Proximate Analysis

The results of proximate analysis at catfish fillets at 0 month are as follows:

Table 2. The results of proximate analysis at catfish fillets

Type of samples	Antioxidant concentration (%)	Water Content (%)	Ash Content (%)	Fat Content (%)	Protein Content (%)
Fresh Fillet	0	79,16	1,13	0,41	19,26
	0,02	79,20	1,05	1,42	18,63
	0,06	79,27	1,00	0,12	19,31
	0,10	79,80	1,07	0,62	18,58
Breaded Fillet	0	73,38	0,85	0,80	20,46
	0,02	72,71	1,05	1,29	16,11
	0,06	75,62	0,92	0,98	19,65
	0,10	73,46	0,92	0,80	17,33

Based on the above results can be seen that the water content in catfish fillets ranged from 72.71 to 79.80 %. Breaded catfish has a water content less when compared with the fresh catfish fillets. Ash content of fresh catfish fillets greater when compared with breaded catfish fillets. The ash content values ranged from 0.85 to 1:13 %. Protein levels were not significantly different between fresh and breaded fillets ranged between 16.11 % - 20.46 %. Catfish fillets fat content ranged from 0.12 % - 1.42 % and among the treatments did not show significant differences.

Microbiological Analysis

The results of microbiological analysis of catfish fillets during storage for 0 month are as follows:

Table 3. Results of Microbiological Analysis Catfish Fillets during Storage for 0 month

Type of samples	Antioxidant concentrate (%)	TPC (CPU)	E.Coli (MPN/ml)	Salmonella
Fresh Fillet	0	$1.85 X10^3$	<3	-
	0,02	$3.90 X10^3$	<3	-
	0,06	$4.05 X10^3$	<3	-
	0,10	$5.00 X10^3$	<3	-
Breaded Fillet	0	$3.9 X10^3$	<3	-
	0,02	$3.0 X10^3$	<3	-
	0,06	$6.7 X10^4$	<3	-
	0,10	$3.0 X10^5$	<3	-

The results of microbiological analysis of catfish fillets during storage for 1 and 2 months shown in Table 4 and 5.

Table 4. Results of Microbiological Analysis Catfish Fillets during Storage for 1 Month

Type of samples	Antioxidant concentration (%)	TPC (CPU)	E. Coli (MPN/ml)	Salmonella
Fresh Fillet	0	$1.31 X10^7$	<3	-
	0,02	$7.5 X10^4$	<3	-
	0,06	$2.99 X10^5$	<3	-
	0,10	$1.67 X10^6$	<3	-
Breaded Fillet	0	$>300 X10^5$	<3	-
	0,02	$1.46 X10^5$	<3	-
	0,06	$>300 X10^5$	<3	-
	0,10	$>300 X10^5$	<3	-

Table 5. Results of Microbiological Analysis Catfish Fillets during Storage for 2 Months

Type of samples	Antioxidant concentration (%)	TPC (CFU)	E. Coli (MPN/ml)	Salmonella
Fresh Fillet	0	$1.36 X10^7$	<3	-
	0,02	$1.19 X10^5$	<3	-
	0,06	$7.85 X10^5$	<3	-
	0,10	$1.20 X10^5$	<3	-
Breaded Fillet	0	$>300 X10^5$	<3	-
	0,02	$5.7 X10^4$	<3	-
	0,06	$5.7 X10^5$	<3	-
	0,10	$>300 X10^5$	<3	-

Based on the analysis of microbiology known that the number of TPC at breaded fillets higher, this is due to the process of making breaded fillets require more time for contact with the outside air, so that the possibility of bacterial contamination is much greater. However, the number of TPC was still below the threshold of tolerance. Storage at low temperatures can inhibit the growth of bacteria, therefore catfish fillets

stored at freezing temperatures + (-18°C) and microbiological analysis of each month. The results of microbiological analysis compared between storage 0 months to 2 months there was an increase of TPC but not significant because the product is stored in a frozen state. The results of microbiological analysis for E. coli and Salmonella bacteria showed negative results so that it can be said fillet products do not undergo the contamination of both bacteria that is safe for consumption.

Sensory Analysis

The results of sensory analysis of fresh products and breaded catfish fillets during storage 0 months shown in Figures 1 and 2.

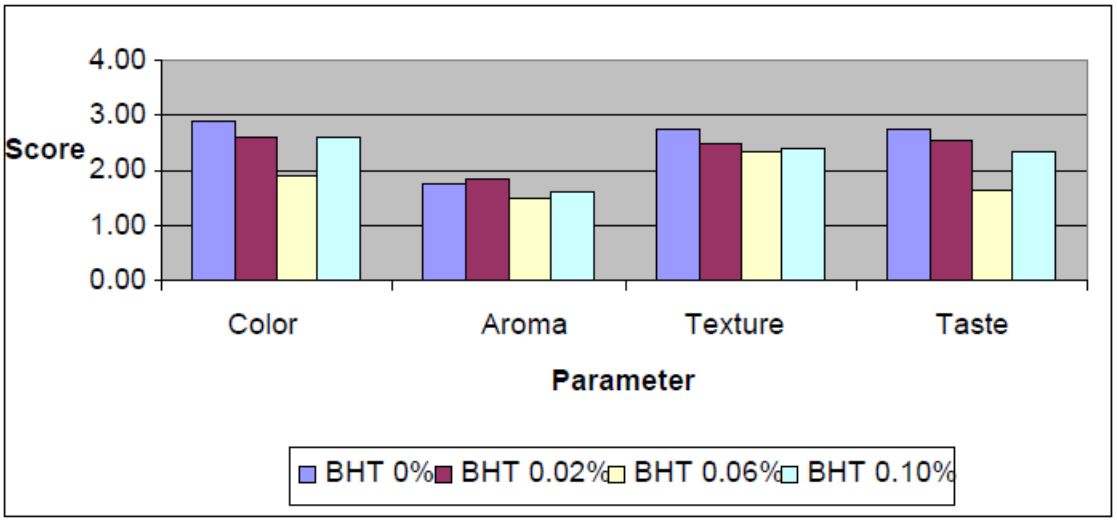


Figure 1. Results of the Sensory Analysis of the Product Fresh Catfish Fillets during Frozen Storage 0 Month

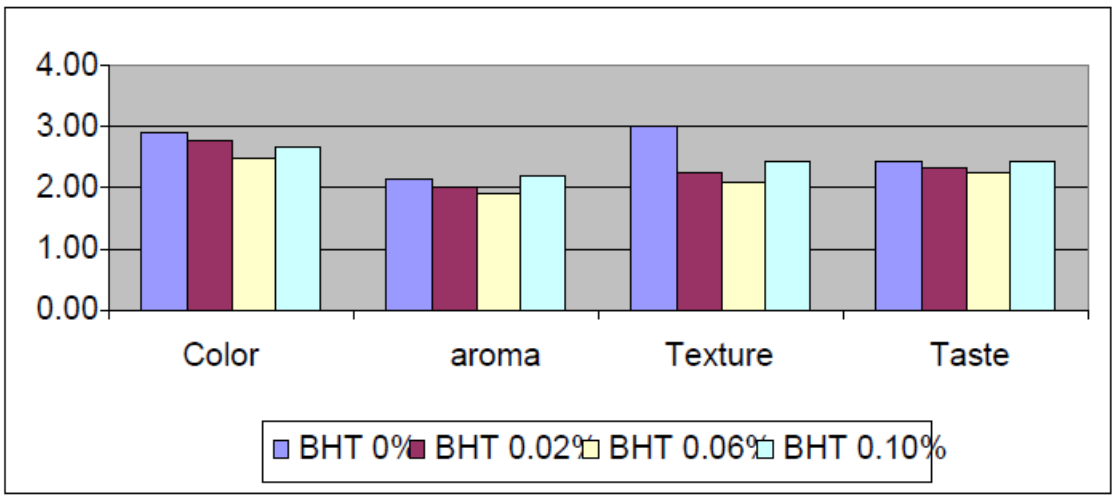


Figure 2. Results of the Sensory Analysis of the Product Breaded Catfish Fillets during Frozen Storage 0 Month

Panelist's assessment results show that the storage 0 month, scores for all sensory attributes are still in good condition with the ratio between the concentrations of antioxidant treatment showed no significant difference. Attributes smell is still in the range of 1 to 2 with a value of 1 indicates a fresh smell, the specific types and increasing the value of diminishing the quality of the fillet.

While the results of sensory assessment for fresh products and breaded catfish fillets during storage 1 month shown in Figures 3 and 4.

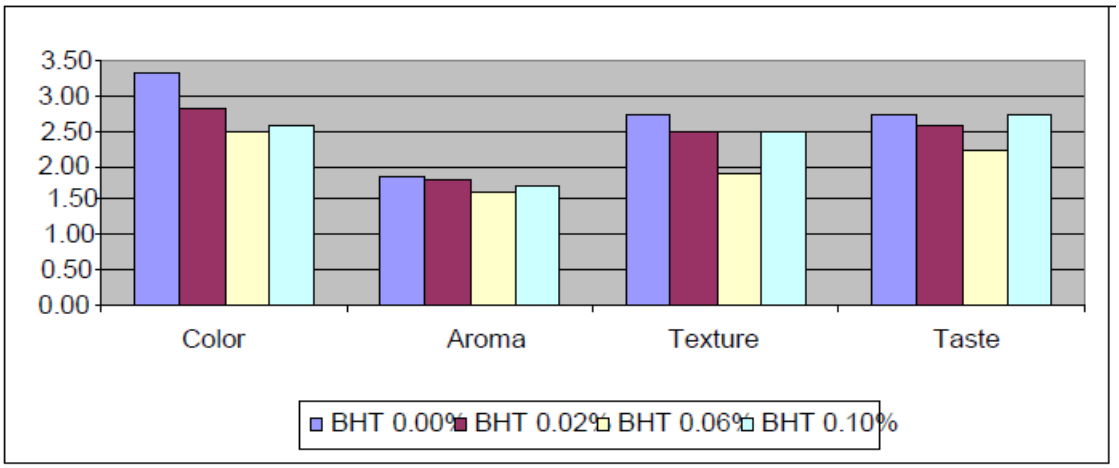


Figure 3. Results of the Sensory Analysis of the Product Fresh Catfish Fillets Frozen Storage for 1 Month

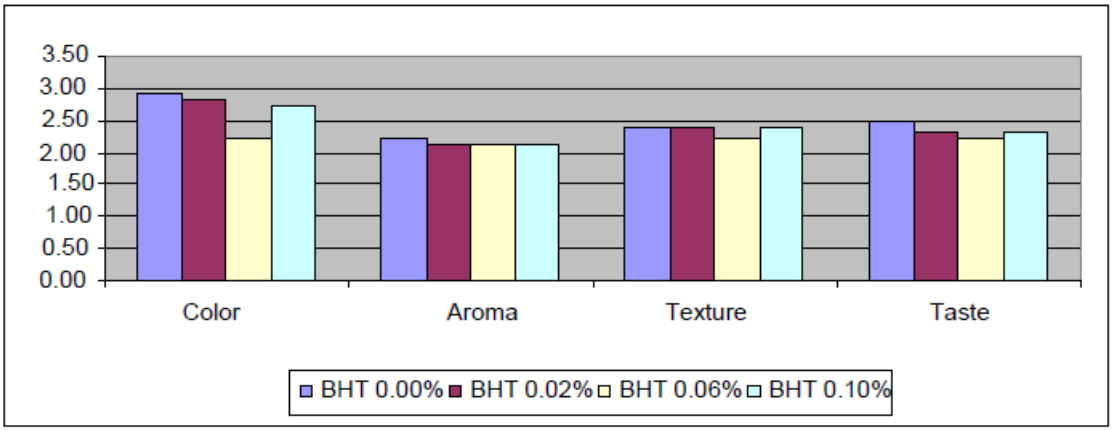


Figure 4. Results of the Sensory Analysis of the Product Breaded Catfish Fillets during Frozen Storage 1 Month

Panelists' assessment results showed an increase in scores in the 1st month of storage for all sensory attributes, both on fresh products and breaded fillets. At odor attributes, scores have touched the Figure 2 for fresh products while the fillet breaded products even touching above Figure 2. For the color attribute, treatment breaded fillets provide better value which is still below the number 3 while fresh fillets already above Figure 3. It shows that the treatment of the addition of bread crumb on fillets real effect on the acceptance panelists. Similarly flavor attributes, preferably panelists breaded products compared to fresh fillet products for all treatment concentrations.

The results of sensory analysis in second month shown in Figure 5 and 6.

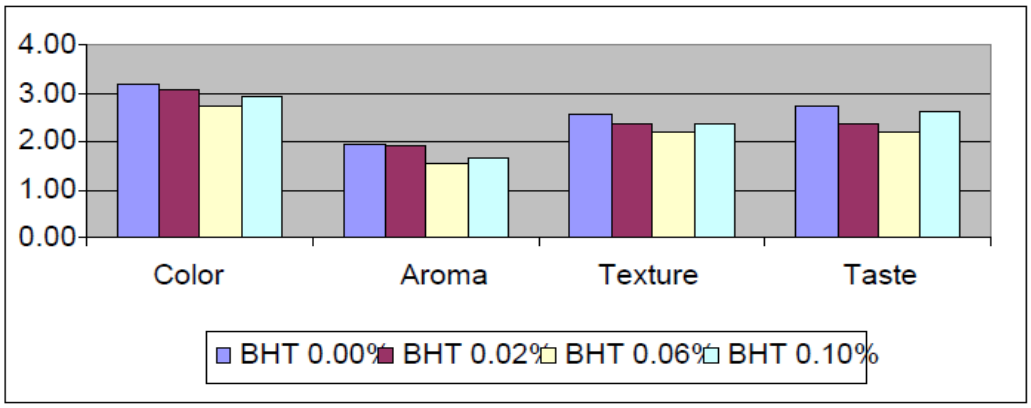


Figure 5. Results of the Sensory Analysis of the Product Fresh Catfish Fillets for 2 Months Frozen Storage

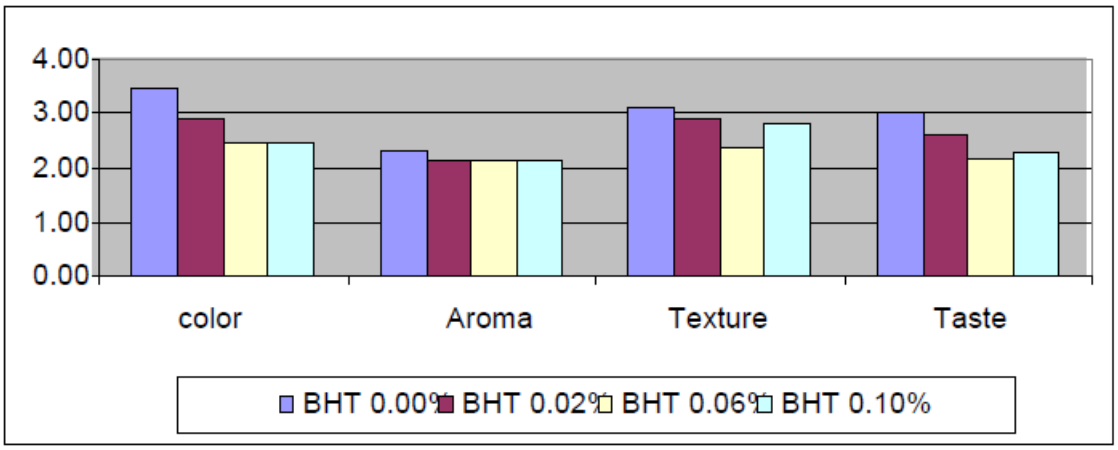


Figure 6. Results of the Sensory Analysis of the Product Breaded Catfish Fillets for 2 Months Frozen Storage

In the second month of storage, it appears that the results of the sensory analysis showed a decrease in overall product quality, but remains below the threshold of acceptance panelists. Addition of antioxidant treatment showed that the concentration of 0.06 % gives the best results for all assessment sensory attributes during frozen storage.

Peroxide Value Analysis

The results of the analysis of peroxide value of fresh catfish fillets during storage with various concentrations of antioxidants shown. The results show that treatment without the use of antioxidants yield the highest peroxide value for 0 to 2 months of storage. This suggests that the use of antioxidant BHT effective to inhibit the oxidation of fat during frozen storage. Treatment use of BHT 0.1% gives the best results with the lowest peroxide value during storage followed by 0.06% concentration by the results were not significantly different. It showed 0.06 % BHT concentration is sufficient to reduce the rate of fat oxidation during storage of fresh frozen catfish fillets.

In fillet breaded products, antioxidant treatment at 0 % yield high peroxide value, while the use of antioxidants 0.1% and 0.06 % yield low peroxide value during frozen storage. This suggests that the antioxidant BHT is able to inhibit the oxidation of fat in the product breaded catfish fillets during frozen storage with sufficient concentration of 0.06 %. However, peroxide value obtained relatively higher compared with catfish fillets of fresh products, this is possible because of the use of breadcrumbs on breaded products that may also undergo oxidation resulting in the increase in peroxide value during storage .

V. Conclusions And Suggestions

1. The use of antioxidant BHT 0.06 % is effective in inhibiting the oxidation of fat in the product fresh and breaded catfish fillets during frozen storage.
2. The results of the panelist's assessment showed that the use of BHT antioxidant 0.06 % is the best based on the attributes of color, smell and taste.

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