Quality Characteristics of Tilapia Crackers Made with Sago Flour as Basic Ingredient

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Abstract

This study aims to determine the characteristics of the formula selected and crackers made from corn starch with the addition of tilapia (Oreochromis niloticus). Treatment factors in this study were different concentrations of tilapia were 30%, 50% and 70%. At the formulation stage conducted organoleptic tests (hedonic) against crackers consisting of texture, taste, color, appearance, and aroma. Phase characterization analyzed are the organoleptic quality of hedonic include texture, flavor, appearance and aroma. Hedonic test results indicate that the selected product is a composition of formula B with 100% corn starch and 50% of tilapia. Kruskal Wallis test results showed that the addition of tilapia no significant effect on the texture and flavor, but significant effect ($p < 0.05$) on appearance, color, and aroma. Results of hedonic quality organoleptic test selected products shows that the cracker has a dry texture and a crisp, distinctive flavor less strong fish, kenampakkan intact, neat, average net thickness, kream brownish color, and has a slight fish aroma.

Keywords: Tilapia crackers; Oreochromis niloticus; sago; Metroxylon Sp.

Introduction

One of the freshwater fish species most widely cultivated by the people of Indonesia is the tilapia. This fish pond and many kept in floating net cages (Suyanto, 1994, in Harris, 2008). Data tilapia fish farming in Indonesia in 2014 was 912,613.29 tons (LAKIP CTF, 2014).

Gorontalo tilapia species of freshwater fish belonging to the most widely cultivated. According to DPK Gorontalo (2014), tilapia fish farming production in 2014 reached 14435.41 tons. The production of this commodity is greater than the other types of freshwater fish such as carp amounted to 285.71 tons, and catfish 6195.76 tons.

Gorontalo tilapia easily found in traditional markets with the selling price relatively cheap, especially tilapia commercial size of ± 10 cm. Kelimpaan tilapia is small, due to the condition of the lake waters Limboto which continues to silting and pollution of water so many fishermen were forced to catch fish before the time of spawning or spawning. The availability of abundant tilapia has not been fully utilized by people of Gorontalo. This fish is only used as processed products with household and underutilized as processed products that have a longer shelf life. Therefore, it is necessary to use tilapia processing products such as the manufacture of crackers that can be consumed in the long term.

Crackers is a kind of dry food made from materials containing starch is high enough. Crackers became public favorite food because it tastes good, tasteful, and light, It also contains nutrients needed by the human body (Keliat, 2013). According Koswara (2009), the main constituent is a starch crackers, then a little protein (derived from fish or shrimp), as well as possibly some kind of vitamins and minerals (which may be derived from fish or shrimp).

The most dominant nutrient content in general crackers are carbohydrates, while protein content is generally relatively low crackers. Consumption of crackers actually provide less significant nutritional improvements so that the fabric crackers need to be added with other ingredients to increase the protein content is by using materials such as fish (Ratnawati, 2013).

Generally manufacture of crackers use tapioca starch as a starch material. The advantages of the starch in the manufacture of crackers that have a good volume development, good crispness and attractive appearance. However, the use of starch in the cracker has the disadvantage of less absorb the taste of fish (Ratnawati, 2013). However, the use of

starch in the manufacture of crackers can be replaced by other sources of starch as filler, one of which is sago.

Sago is a monocot plants from the family (family) Palmae. Sago starch extracted from sago (MetroxylonSp.) Obtained from the contents of the trunk (pith) through simple processing (Astuti, 2009). Judging from its nutrient content, amylose corn starch containing 27% and 73% amylopectin (Fadila, 2011). The content of amylopectin in corn starch useful to improve the quality of product appearance, not easy to agglomerate, and has a high adhesion (Astuti, 2009).

Other nutrients in corn starch that is superior to that of tapioca starch, calcium 11 (mg), phosphorus 12.7 (mg), iron 1.5 (mg), thiamin 0.01 (mg), and potassium 1.2 (mg) (Astuti, 2009). In addition, sago starch having expands the power of 97%. Sago is found in Gorontalo province, especially in the district of Bone Bolango, Boalemo and Pohuwato (PKPP, 2012). Sago type that grows in Gorontalo area known as sago sago beka Tumba or type that is not spiked (Metroxylon sago rottb). In addition to the availability of abundant sago, sago in Gorontalo price is relatively cheap. However, the potential of sago in Gorontalo area is still not optimally utilized. Based on this research needs to be done about the "Utilization of Tilapia (Oreochromis niloticus) in the Making Crackers Made Basic Sago Flour (Metroxylon sp.)".

The purpose of this study was membuatformula crackers tilapia (Oreochromis niloticus) made from corn starch (Metroxylon sp.), Which can produce a cracker product that has nutritional value and better quality.

Research Methodology

The tools used in the manufacturing phase of tilapia fish crackers are digital scales, basins, knives, cutting boards, grinding machine, plastics, thermometer, pans, and stoves, and dryers mechanics. Raw materials used in the manufacture of crackers are tilapia, corn starch, sugar, salt, garlic, egg whites, water and coconut oil.

This research was conducted two phases of preliminary research and primary research. The preliminary study was conducted to determine the formulation used in making fish crackers nila.Formulasi seasoning done by trial and error, as follows: (A) 100% corn starch, tilapia 50%, 4 g salt, egg whites 30 g, 5 g sugar, 5 g garlic, and water 60 ml, (B) 100% of corn starch, tilapia 100%, 5 g salt, egg whites 30 g, 5 g sugar, 5 g garlic, and water 60 ml.

In the main study done is to find a formulation crackers made from corn starch with the addition of tilapia that is (A) 100: 30%, (B) 100: 50%; and (C) 100: 70% and organoleptic tests performed.

Tests conducted on this cracker products starting with the subsequent hedonic product organoleptic selected from organoleptic testing organoleptic continued with hedonic quality.

Data obtained from the hedonic sensory test on primary research analyzed using non-parametric statistical methods Kruskal-Wallis. Hasil uji organoleptik in stacking the score sheet (Walpole, 1993). The data processing is done with the help of the software Statistical Package For Social Science 16 (SPSS 16). If the results are significantly different to do a further test using Duncan test to find out which treatment affords a significantly different effect on the parameters analyzed..

Results and Discussion

Texture

Histogram organoleptic texture of crackers can be seen in Figure 1.

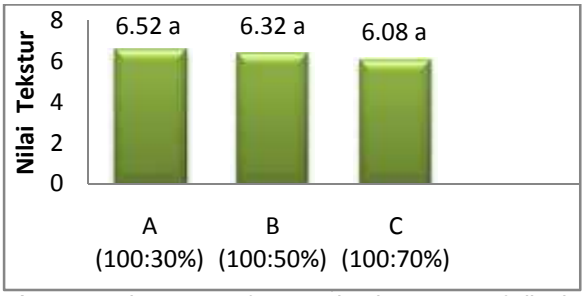

Figure 1 Histogram of organoleptic texture of tilapia cracker. The values in the diagram yangdiikuti letter berbedamenunjukkan berbedanyata results (p <0.05).

Based on the histogram in Figure 1, it is known that the organoleptic value of texture crackers highest tilapia is the result of formulation A, located on the criteria rather like the value of 6.52, and organoleptic value of texture is lowest tilapia fish cracker crackers tilapia formulation C results with a score of 6 , 08. Results Kruskal-Wallis, showed that the addition of

tilapia meat on all three formulations showed results that were not significantly different (p> 0.05). The addition of tilapia 30%, 50%, and 70% did not have a significant influence on the texture of crackers tilapia and all proceeds rather preferred formulations panelists.

Crackers results formulation A (100: 30%), B (100: 50%), has a dry and crunchy texture. This was caused by the use of corn starch concentration is more than meat tilapia. Sago flour containing 93% amylopectin. Amylopectin function provides crisp properties on crackers. Crackers with a content of amylopectin higher will have the development of a high, because during the heating process will occur gelatinization process and will form the structure of the elastic which can then be inflated at this stage of the frying pan so that crackers with volume of development was higher will have the crispness high (Wahyuningtyas, 2013).

Crackers formula C (100: 70%) have a dry texture and crisp, but less expands. This is due to the formula C concentrations of fish are added as high as 70% resulting in lowerflower power crackers. According to Setiawan (2013), a high protein content tends to decrease the development of crackers that can cause air pockets produced crackers is getting smaller because the density of air pockets are filled by other materials, which are proteins.

Taste

Histogram value organoleptic taste crackers tilapia can be seen in Figure 2.

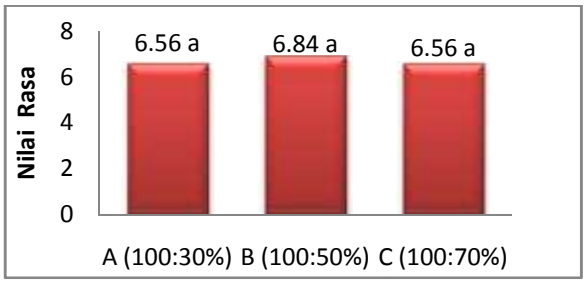

Figure 2 Histogram of organoleptic taste of tilapia fish crackers. The values in the diagram are followed by different letters indicate significantly different results (p <0.05).

Based on the histogram in Figure 2, it can be seen that the organoleptic taste of tilapia fish crackers in formula A, B and C are at criteria like the value of 7.0. Kruskal-Wallis test results showed that the addition of tilapia fish meat on crackers did not significantly affect the taste of crackers. A taste of fish crackers third nilapada formulations, A (100: 30%), B (100: 50%), and C (100: 70%) showed results that were not significantly different (p> 0.05).

Results crackers formulation of tilapia has a taste similar and difficult to distinguish by the panelists that acceptance panelists to taste crackers tilapia were not significantly different. It is caused by the concentration of corn starch that is used in all three formulations was higher than the concentration of tilapia fish meat is added, which is as much as 100%, whereas the concentration of fish is added, namely 30%, 50% and 70%.

A third formulation (100: 30%), B (100: 50%), and C (100: 70%) had a little taste of the fish. This is caused by the use of corn starch with a higher concentration of tilapia fish meat, so the taste of tilapia fish on crackers covered by corn starch. This is in accordance with the statement of Sandriana (2012), that the use of corn starch Molat (M. sagusRottb) as a binder on a cracker with corn starch concentration of 80% and 40% of shrimp shrimp flavor is covered by corn starch that is used.

Color

The results of the analysis of color of tilapia crackers can be seen in Figure 3.

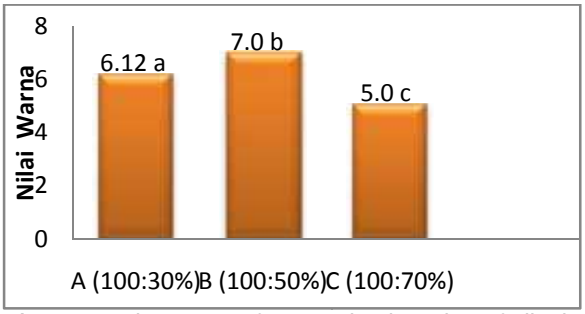

Figure 3 Histogram of organoleptic color of tilapia crackers. The values in the diagram are followed by different letters indicate significantly different results (p <0.05).

Based on the histogram in Figure 3, it can be seen that the organoleptic value hedonic color crackers tilapia is highest crackers tilapia result of the formula B, currently on criteria like the value of 7.0 and organoleptic value of color lows are crackers tilapia formula C, located on the criteria of neutral

value 5.0. Kruskal-Wallis test results showed that the addition of tilapia meat significantly affect the color crackers. Color crackers tilapia in the three formulations showed significantly different results ($p < 0.05$), so proceed with further testing. The test results further with Duncan, color cracker products tilapia formulation A (100: 30%), B (100: 50%), and C (100: 70%) was significantly different.

Color chips with the addition of tilapia 30% yield brownish yellow color, but less bright. This was caused by the use of corn starch which is more than fish. Type of corn starch that is used is white rather dull thus affecting the color crackers.

Crackers with the addition of tilapia 50% yield crackers with a brownish yellow color is brighter than fish crackers with the addition of 30%, so the crackers preferably panelists. It was caused by the increase in the number of tilapia fish meat is added. In accordance with the statement of Laiya (2014), that the higher the concentration of fish meat used, the influence of color produced fish crackers. Brownish yellow color on crackers caused by the non-enzymatic browning reactions (Maillard). Maillard reaction occurs because of the amino acid lysine and glucose reacts at high temperatures to produce melanoidin brown (Ariyani, 2013).

Crackers results formulation C (100: 70%), has a brownish yellow color but slightly darker than crackers formula A and B, so that less favored panelists. Based on trial and error that has been done, crackers with a higher number of fish meat that is 70% less fluffy and more easily burned. It is caused by increasing concentrations of tilapia meat on crackers produce crackers with a brownish yellow color is a bit dark. Winarno (1997) states that, the addition of fish flesh tends to contribute to a brownish color resulting protein contained in the fish, so that in case the heating process will occur Maillard reaction. Organoleptic differences of color on the third cracker formulation of tilapia caused by the increasing concentration of tilapia fish meat is added. In addition the use of a binder also affects the color crackers. Differences mold also affects the color cracker crackers produced. The thinner molds, crackers produced has a lighter color. In addition, the frying time is not the same crackers crackers produce diverse colors. The longer the time frying chips, the resulting color is getting dark (scorched) (Wardani, 2014).

Appearance

Histogram of organoleptic hedonic appearance of tilapia crackers can be seen in Figure 4.

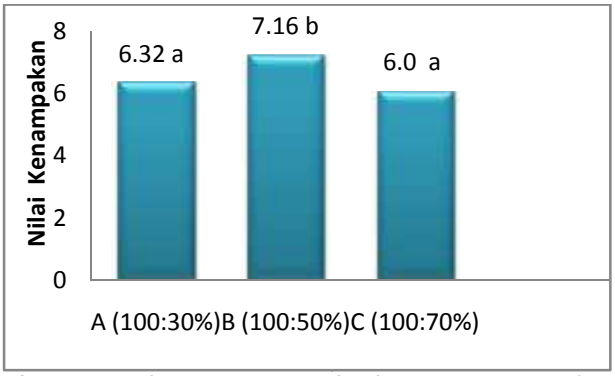

Figure 4 Histogram organoleptic appearance of tilapia crackers. The values in the diagram yangdiikuti letter berbedamenunjukkan berbedanyata results ($p < 0.05$).

Based on the histogram in Figure 4 can be seen that the value of the organoleptic appearance of crackers with the addition of tilapia tilapia highest crackers with formula B. The hedonic value organoleptic criteria that are in love with a value of 7.16 and the lowest value of organoleptic appearance is crackers are tilapia formula C the criteria a bit like with a value of 6.0. While tilapia fish crackers that are in the criteria formula A bit like with a value of 6.32. Kruskal-Wallis test results showed that the addition of tilapia meat significantly affect the appearance of crackers. The appearance of crackers with the addition of tilapia 30%, 50% and 70% showed a significant difference ($p < 0.05$), so do follow-up testing. Continued with Duncan test results, showing that the appearance of tilapia fish cracker significantly different formulations and formulations A and C, while the appearance of crackers with the addition of tilapia formulation C is not significantly different from the formulations A.

Crackers with the addition of tilapia as much as 30% has the appearance of a somewhat favored by consumers. This is caused by the use of corn starch to more. The use of wheat flour produces more crackers appearance olehadanya semakinkasar caused air bubbles that terdapatpada more crackers surface so smooth surface menjaditidak crackers (Istanti, 2005).

Crackers formulation B with the addition of tilapia as much as 50% has the appearance that consumers preferred. It is thought to be caused by the use of tilapia meat. The appearance of crackers increasing seiringdengan increasing addition of fish flesh. In the study Istanti, (2005) on fish crackers brooms, stating that the cracker with the addition of fish meat has a smoother surface and compact. The statement is in accordance with the statement of Laiya (2014) on the study of fish cracker cork, that the addition of the fish meat will lead to more refined crackers caused by the protein content in fish is mikromolekul which has a hydrophilic group (a compound that can bind to the water). Cluster hydrophilic protein in fish is much larger than the starch so that the three-dimensional network of more subtle and more delicate surfaces generated.

Crackers formulation C with the addition of tilapia as much as 70% have assessed the appearance rather liked by consumers. It is thought to be caused by the use of tilapia meat is increasing. In the frying process, crackers development occurs due to release of water bound to the gel. The water will initially be steam because there is an increase in temperature, and urged the starch to break out at once, resulting in the evacuation of air pockets forming on crackers (Koswara, 2009). With increasing concentration of fish meat is added, will increase the protein content of crackers. High protein content tends to reduce the power of fireworks crackers, it is suspected because of air pockets that should have been filled with water, filled by other materials, which are proteins (the Goddess, 2014).

According Fenneme (1976) in Solihat (2004), the cracker products made from fish contains high protein, but their appearance for darker. The more the fish meat used, the more protein in fish crackers, the darker appearance for anyway. In addition to protein, frying temperature also affects the appearance of crackers. Generally fried crackers at a temperature of ± 180-200ºC within 10 seconds (Ariyani, 2013). But in this study, the frying temperature is ± 110ºC within 21 seconds. Based on trial and error, crackers made from sago starch is easily charred frying at temperatures above 110ºC, and less unfolded (rather loudly in the middle of crackers) at frying temperature below 110º.

According to Said (2014), the appearance of brown color on a cracker is basically a phenomenon Mailard reaction. Browning reaction is non-enzymatic reaction that ccurs because of the aldehyde group (a compound containing a carbonyl group binds to atomhidrogen) of carbohydrate mutually react with amino groups of proteins at high temperatures. This reaction gives a complex change, one of which plays a role in displaying the color, flavor, aroma and texture.

Aroma

The results of the analysis of organoleptic hedonic value crackers aroma of tilapia seen in Figure 5.

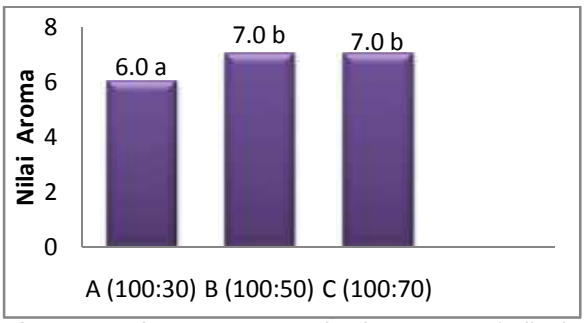

Figure 5 Histogram organoleptic aroma of tilapia crackers. The values in the diagram are followed by different letters indicate significantly different results ($p < 0.05$).

Based on the histogram in Figure 6, it can be seen that the value of the highest fish crackers organoleptic aroma formulation B is located on criteria like grades 7,0 and organoleptic value aroma crackers lowest tilapia is the formulation currently on the criteria A bit like with a value of 6.0. While crackers formulation C has an aroma that is on criteria like the value of 7.0. Kruskal-Wallis test results showed that the addition of tilapia meat significantly affect aroma crackers. Aroma crackers tilapia in the three formulations showed significantly different results ($p < 0.05$), so do follow-up testing. Further test results with Duncan, the aroma of tilapia fish crackers A formulation results significantly different from the formulations B and C. It is caused by the amount of fish concentrations, written less than formula B and C. While crackers formula B and C, were not significantly different and distinct real formula A.

This is caused by an increase in the number of fish meat is added to the formula crackers A and B is

50% and 70%, thereby increasing the aroma crackers.

Crackers with the addition of tilapia 30% yield neutral aroma aroma means no fish. This was caused by the use of corn starch that is more dominant and the amount of meat slightly so that the aroma of tilapia fish less. In accordance with the statement of Laiya (2014), that the use of corn starch that more will cover the aroma of the fish were added on crackers Crackers formulation B (100: 50%) and C (100: 70%), generating little fish aroma. This was caused by the increasing concentration of tilapia fish meat is added will enhance the distinctive aroma of fish on crackers.

Laiya (2014), stating their distinctive aroma of fish crackers are caused by proteins that break down into amino acids, especially glutamic acid which will cause the taste and aroma lezat.Yusuf (2011) in Laiya (2014), states that frying can also affect the scent. The resulting distinctive aroma of fried food products due to the chemical reaction of the components contained in the material compound.

Characteristics of selected products

Based on the test results with Bayesian methods, products are selected according to the results perengkingan formula B (use of corn starch to 100% with the addition of tilapia 50%). Crackers formula B is a cracker or most preferably selected panelists.

The results of the analysis of the organoleptic quality of tilapia fish crackers elected conducted to determine the quality of tilapia fish cracker texture was selected based on criteria of appearance, flavor and aroma.

Texture analysis results for the criteria that the value range in the 7.4 or 7. In accordance that the value can be said that the cracker tilapia elected texture is dry and crisp. Texture expected crackers are crackers with a crisp texture (Ariyani, 2013). The results of the analysis to the criteria of taste acquired value of 7.8 or revolve around the number 8. Under the value can be said that the criterion crackers have a distinctive flavor of tilapia fish, but less powerful. Taste fish specialties arise due to the addition of tilapia meat. Distinctive flavor produced fish on crackers less powerful, it is caused by the concentration of tilapia used in the manufacture of crackers less that 50%, compared to 100% of corn starch. According Laiya (2014), the addition of corn starch that is more than the fish, causing the characteristic flavor of fish will be covered by sago. Because corn starch had a little taste fresh. While fish have aroma and distinctive taste and can add to the savory flavor of fish crackers.

The results of the analysis to the appearance of the criteria that the value range of 7.4 or 7. Based on these values can be seen that the panelists expressed tilapia fish crackers appearance intact, neat, clean, average thickness, kream brownish color. Kream brownish color due to the addition of tilapia meat. Based on the statement Istanti (2005), the addition of fish flesh tends to contribute to a brownish color resulting protein contained in the fish, so that in case the heating process will occur Maillard reaction. The results of the analysis to the criteria of 7.52 or aroma obtained values ranged in value of 7. As the range of values, the assessment results can panelists concluded that the cracker tilapia little fishy. The aroma of this fish comes from tilapia raw materials used in the manufacture of crackers tilapia. Aroma fish crackers affect the flavor of tilapia. Besides the addition of seasonings such as garlic and salt also poses a delicious flavor and aroma.

Conclusion and Suggestion

Based on research that has been done can be concluded that the addition of tilapia meat 30%, 50% and 70% have real impact on appearance, color, aroma, and did not significantly affect the taste and texture. Formula crackers tilapia that are the ratio of corn starch and tilapia 100: 50% with the organoleptic characteristics selected are in appearance (intact neat, clean, average thickness, color kream brownish), aroma (fish bit), taste (fish less powerful), and texture (dry).

Need to do research about the formation of the dough before steaming techniques, and techniques of molding or incision to further obtain better uniformity. In the frying process should use a frying pan with the system used to soak crackers in cold oil, then transferred to the oil that has been heated to obtain better development.

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