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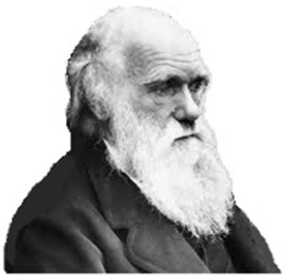

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Effect of Heating Process Length on Presto Favorite Levels of Lalawak Fish - *Barbodes balleroides* (Valenciennes, 1842)

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ABSTRACT

Lalawak (*Barbodes balleroides*) is a fish that dominates the waters in the Jatigede Reservoir. This fish has a lot of thorns and bones, and in terms of processing it has not been used properly, so it is necessary to process it in a different way where one of them can be done using presto techniques. The purpose of this study is to determine the heating time to make the lalawak fish presto the most preferred by panelists. This study uses an experimental method with Friedman Test, multiple comparisons and Bayes Test for processing data with 3 treatments of warm-up time, namely 60 minutes, 90 minutes, and 120 minutes with 20 panelists as replications. The results of the hedonic test showed that the appearance and aroma were not significantly different between treatments, while the texture and taste were significantly different between treatments where the average value of treatment was 60 minutes, 90 minutes, and 120 minutes, respectively from the texture of 6.0; 6.3; 7.5, and taste which is 6.7; 7.1; 8.0. The treatment with a heating time of 120 minutes is the most preferred treatment by the panelists and this treatment is carried out by a proximate test to see the chemical content in it. The proximate test results for the prestige of lalawak fish with a 120-minute treatment were 36.56% moisture content; 29.68% protein; 12.66% fat; 4.78% ash; 16.32% carbohydrates; and 127.4 mg / 100 g calcium levels.

***Keywords*:** hedonic, lalawak, organoleptic, presto, proximate, *Barbodes balleroides*

1. INTRODUCTION

Indonesia is a developing country that is still overshadowed by nutritional problems or commonly known as malnutrition. Malnutrition problems are still found in several regions in Indonesia such as in the NTT region, West Kalimantan, and Maluku, according to Nutrition

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Status Monitoring in 2016. Patients with malnutrition in infants in 2007 as many as 18.4% of all children under five were examined, then in 2013 increased to 19.6%. Malnutrition can be overcome by fulfilling nutritional needs, one of which is by meeting calcium needs per day. Calcium is one of the important micronutrients for the body. Data from Seamic Health Statistic in 2000 said that Indonesian people's calcium intake was 254 mg / day. This is still very low compared to the recommended Nutritional Adequacy Rate of 500-800 mg / day. Calcium requirements can be met by consuming milkfish presto because milkfish contains large amounts of calcium. Milkfish presto / soft thorns have a high calcium content of 1422 mg / 100 g, by data of the Ministry of Health of the Republic of Indonesia in 2005.

Photo 1. *Barbodes balleroides* (Valenciennes, 1842)

Presto comes from the name of the pan used, namely the pressure cooker. Milkfish presto or soft thorn milkfish is one of the processed products of milkfish, with the advantages of bone and thorns from the tail to the soft head so that it can be eaten without causing disruption of thorns in the mouth. It does not rule out the possibility that fish other than milkfish can be processed into soft thorn fish, for example lalawak fish. Lalawak fish (*Barbodes balleroides*) is one type of fish that lives in public waters (such as the Cimanuk river) and has the potential to be developed as a consumption fish, although it has not yet become an endangered species, needing attention because in some locations it was greatly reduced. Lalawak fish in the Jatigede Reservoir are the most commodities in these waters. Many lalawak fish are found in the Jatiluhur Reservoir, Lahor Reservoir, Gadjah Mungkur Reservoir, and also rivers such as the Cimanuk River in West Java and Serayu River in Central Java. People used to process lalawak fish by frying or pressing it, but lalawak fish had many and fine thorns and a sharp fishy odor, so it was necessary to process lalawak fish in other ways where one of them used the technique presto. Modern processing of soft thornfish uses autoclave for cooking.

The principle of using autoclave in cooking soft spines is to use high pressure and temperature. The processing uses high temperatures (115-121 °C), and with a pressure of 1.5 atmospheres. This high temperature and pressure is achieved by using a high-pressure steamer (autoclave) or on a household scale with a pressure cooker for 1-2 hours. There are different effects on the duration of presto warming of fish, such as fat content, protein, calcium and also

affect the taste, aroma, texture, appearance, and overall level of preference. Based on this background, it is necessary to do research on the effect of the length of the heating process on the level of preference of the presto lalawak fish. This research aims to determine the length of heating time to make the most preferred presto lalawak fish and to find out the chemical content of the treatment most preferred by panelists.

Taxonomic Hierarchy

Kingdom	Animalia – Animal, animaux, animals
Subkingdom	Bilateria
Infrakingdom	Deuterostomia
Phylum	Chordata – cordés, cordado, chordates
Subphylum	Vertebrata – vertebrado, vertébrés, vertebrates
Infraphylum	Gnathostomata
Superclass	Actinopterygii – ray-finned fishes, spiny rayed fishes, poisson épineux, poissons à nageoires rayonnées
Class	Teleostei
Superorder	Ostariophysi
Order	Cypriniformes – cyprins, meuniers, minnows, suckers
Superfamily	Cyprinoidea
Family	Cyprinidae – carps, minnows, carpas y carpitas, carpes et ménés, carps and minnows, carpes, ménés, carpitas, carpas
Genus	Barbodes Bleeker, 1859
Species	*Barbodes balleroides* (Valenciennes in Cuvier and Valenciennes, 1842)

Distribution: from Viet Nam to Indonesia.

2. MATERIALS AND METHODS

This research was conducted at the Fisheries Product Technology Laboratory of Padjadjaran University and the Pasundan University Food Technology Laboratory. The time for the research activities starts from February 2019 to March 2019. The materials used include lalawak fish, water, spices (turmeric, galangal, ginger, onion, garlic, bay leaves, orange leaves, salt, pecan, lemongrass, coriander, seedless acid, flavoring). The tools used include: presto pans, knives, spoons, cutting boards, electric scales, basins, gas stoves, plastic containers, cameras, blenders, styrofoam plates, questionnaire sheets. The procedure for processing presto of lalawak fish starts from the preparation of fish, weeding, washing to clean, giving evenly spiced ingredients, arranging fish into the pan, cooking during the treatment, and serving the panelists.

The method used in this study was the experimental method, using 3 different presto heating time treatments, namely: 60 minutes, 90 minutes, and 120 minutes treatment with 20

semi-trained panelists as a test. The parameters observed in this study were 2, namely: the level of preference, and the chemical content of the lalawak fish presto most favored by the panelists. Analysis of the data used for the level of preference is 3, namely: Friedman test, multiple comparisons, and Bayes test, whereas for chemical levels there are 6, namely: water content, ash, protein, fat, carbohydrate, and calcium.

3. RESULTS

Organoleptic testing in the food industry especially for processed fishery products has a very important role. The level of preference / hedonic test aims to determine the response of the panelists to the organoleptic characteristics of the lalawak fish presto product which consists of appearance, aroma, texture, and taste based on 1-9 hedonic scale (1: very dislike, 3: dislike, 5: normal / neutral, 7: like, and 9: really like) with acceptance limits > 5 means that if the product has a value equal to, or greater than 5, then the product can be accepted or liked by the panelists. The hedonic test analysis was carried out using the Friedman test. Data on the hedonic test results of lalawak fish can be seen in (Table 1).

Table 1. Results of Lalawak Presto Hedonic Test.

Treatment (minutes)	Appearance		Aroma		Texture		Taste	
	Avergae	Median	Average	Median	Average	Median	Average	Median
60	8.0 a	8	6.3 a	7	6.0 a	7	6.7 a	7
90	8.0 a	8	6.7 a	7	6.3 ab	7	7.1 ab	7
120	7.3 a	8	7.1 a	7	7.5 c	7	8.0 b	8

Description: Numbers followed by different letters indicate a significant difference in the test level of 5%.

The presto heating of lalawak fish with different treatments has an effect but is not real to its appearance. The 60-minute and 90-minute treatment gets the average value and the same median value is 8.0. Warm up time that does not break the fish body parts and there are no foreign objects in it. The cleanliness of the processing of presto products of lalawak fish is very well maintained, from the receipt of raw materials to the stages of hedonic testing and chemical content testing, so that the product is free from foreign objects such as metals and hazardous chemical objects. The 120-minute treatment obtained the average value and the lowest median value was 7.3 and 7.0. Long heating times make the body part of the fish become slightly broken.

The appearance of the 60-minute treatment and 90 minutes is more brilliant than the 120-minute treatment. This is allegedly due to the influence of the water content, the longer the heating process, the more the water evaporates. Presto lalawak fish has a brownish yellow color. The yellow color is obtained from the administration of turmeric, while the brown color is

obtained from high temperatures and the length of the heating process. The longer the heating process, the more brownish the color of the lalawak fish presto. The use of high temperatures with long heating can cause browning reactions in fish due to reactions between proteins, peptides, and amino acids with the results of fat decomposition. Criteria for fine quality and color of presto processed fish products are whole fish and not broken, smooth, clean, no foreign matter, no fat deposits, salt or other impurities, specific colors, bright, not moldy, and not slimy.

Based on the results obtained, different treatments have an effect but are not real. The average value shows the longer the process of heating the presto of lalawak fish, the level of preference of panelists on aroma presto fish increases. This is presumably because the longer the process of heating the fish, the absorption of the spices used will also be high so that the aroma of the fish's presto will be more noticeable. The time length of cooking will affect the impregnation of seasonings into meat. All treatments are still favored by panelists, as seen from the median value of 7 (likes). The 120-minute treatment has a savory aroma, typical of boiled fish, fresh without the smell of rancid, sour, rotten or stale, while the 60-minute treatment has a quite savory aroma, typical of boiled fish, fresh without the smell of rancid, sour, rotten or stale. Volatile compounds that contribute to aroma are produced by oxidative enzyme reactions and automatic oxidation of lipids. The fat content in fish meat directly affects aroma. Aroma or smell is one of the parameters that determine the savory taste of a food product. The quality criteria of presto processed products in terms of aroma are specific such as boiled, savory, fresh fish, without the smell of rancidity, sour, stale, or rotten.

Based on the results obtained, the average value indicates the longer the presto heating process of lalawak fish, the level of preference of the panelists on the texture of presto fish increases. The highest average value is owned by the treatment with a heating time of 120 minutes which is 7.5 while the lowest average value is owned by a 60 minute treatment. The most important texture in soft foods and crispy foods. The long heating process at the lalawak fish presto makes the bones and fish spines soft, this is also experienced by the 120-minute treatment where the bones and spines of fish become soft while the 60-minute treatment of fish bones is still hard. The pressure used in the process of cooking fish presto is the pressure that comes from the accumulation of hot steam which is heated for a long time and works in a closed system so that the pressure is able to soften the bones and fish spines. The 120-minute treatment has a texture of meat that is quite dry, compact, and soft when eaten while the 60-minute treatment has a fairly dry texture of the meat, slightly not compact, and not too soft. All treatments are still favored by panelists, as seen from the median value of 7 (likes). The presto quality criteria for fish for the texture category are compact, dense, fairly dry, not runny, and rough.

Based on the results obtained, the average value indicates the longer the process of heating the presto of the lalawak fish, the level of preference of the panelists towards the sense of presto of the fish increased. The highest average value and median value is owned by treatment with 120 minutes warm up time which is 8.0, while the lowest average value is owned by 60 minutes treatment. Taste is a very important factor in determining the acceptance or rejection of a product by a panelist. The taste can be assessed in response to stimuli derived from chemicals in a food on the tongue which gives the impression of sweet, bitter, sour, and salty.

The long treatment process of presto heating for 120 minutes of brawny fish has a savory and salty taste that is evenly distributed, while the 60 minutes treatment has a taste that is quite savory and the taste is not evenly salted. In general, it can be assumed that processed fish has a higher number of taste components compared to raw fish. The increased component of taste is

thought to be due to the results of the biochemical proteins and lipids of fish. The concentration of taste components is found to be much higher in the analysis of volatile components because the water content decreases during the heating process which results in a higher concentration of the flavor components in the final product.

The flavor components are formed from the results of oxidation and enzymatic hydrolysis of native fish components such as lipids and proteins. The lower water content in the sample will produce another amount higher in size. Analysis of amino acids steamed processed products shows improvement compared to fresh products. This increase can be affected by proteolytic reactions that occur during steaming. The highest number of amino acids is glutamic acid which implements the product of umami taste. The taste is influenced by several factors, namely chemical compounds, temperature, concentration, and interactions with other taste components. The product quality criteria presto fish with taste categories are savory specific presto fish with soft thorns, not too salty, and evenly salty taste. All treatments are still preferred by panelists, seen from the median value > 7 (likes).

The results of paired comparisons are done by matrix manipulation to determine the criteria weights. The weight of the appearance criteria, aroma, texture, and taste of the lalawak fish presto are presented in (Table 2).

Table 2. Weight Score Criteria for Presto Lalawak Fish.

Criteria	Criteria Weight
Appearance	0.10
Aroma	0.17
Taste	**0.56**
Texture	0.16

Based on the calculation of the weight of the appearance criteria, aroma, texture, and taste of the lalawak fish presto, it was found that the lowest criterion weight was owned by the 10% appearance criteria, while the highest criteria weight was owned by the taste criteria which was 56%. This shows that taste is the most influential criterion for the evaluation of lalawak fish presto. The product quality criteria presto fish with flavor categories are savory specific presto fish with soft thorns, not too salty, and evenly salty taste. If the taste of the lalawak fish presto is not liked even though other criteria show better value, the product will be rejected by the panelist.

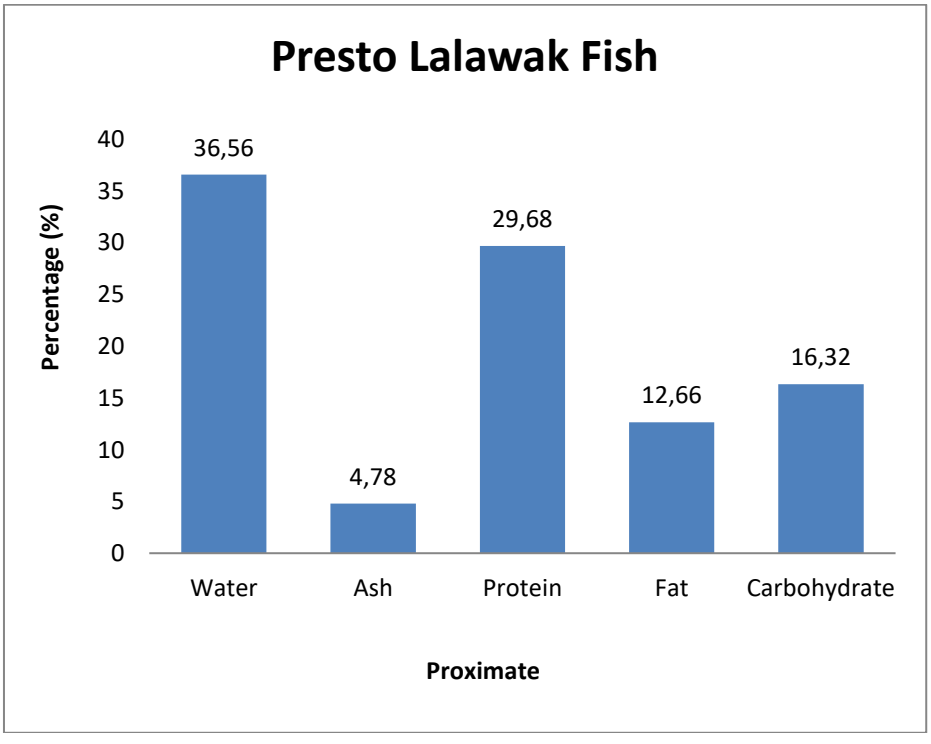
The best decision making is done by the Bayes method. The results of calculating the criteria and priority values in determining the best treatment by considering the appearance criteria, aroma, texture, and prestige of lalawak fish are presented in (Table 3).

Based on the calculation using the Bayes method, it was found that the prestige of the lalawak fish with a 120-minute warm-up treatment had an alternative value and the highest priority value was 7.56 and 34%. Presto lalawak fish with 120 minutes warm-up treatment is the best treatment most preferred by panelists.

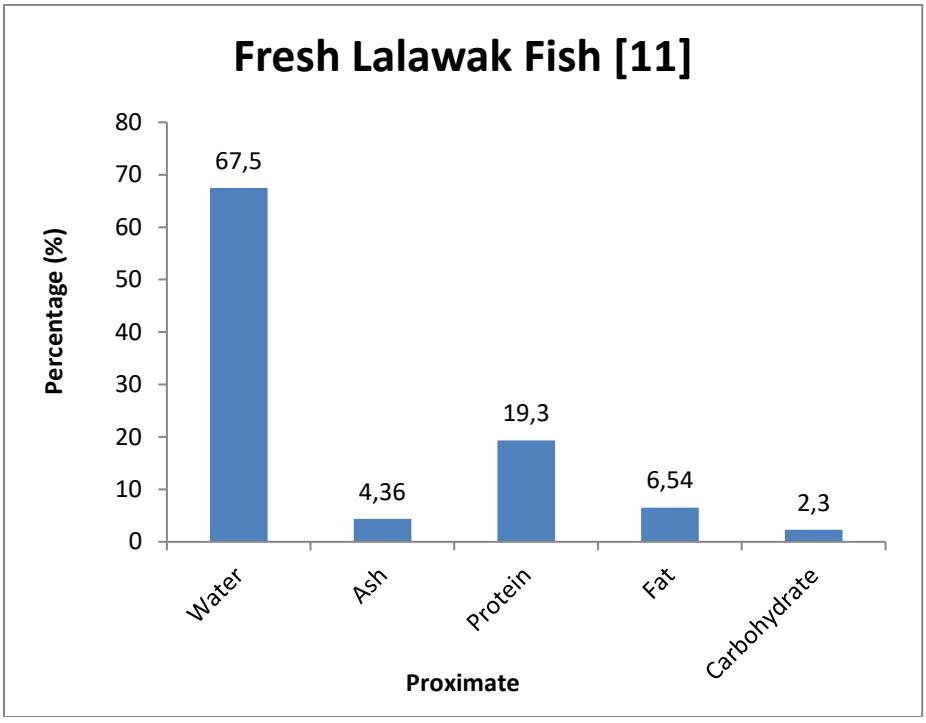
Table 3. Assessment Decision Matrix with Bayes Method.

Treatment	Criteria				Alternative Value	Priority Value
	Appearance	Aroma	Taste	Texture		
60 min	8	7	7	7	7.10	0.33
90 min	8	7	7	7	7.10	0.33
120 min	7	7	8	7	7.56	**0.34**
Weight	0.10	0.17	0.56	0.16	21.76	1.00

The proximate test on the prestige of the lalawak fish is based on the results of the assessment of the panelist's preference for the fish tested. Based on the results of the favorite test, it was found that the prestige of the lalawak fish with a heating time of 120 minutes was the most preferred fish presto, so this treatment would be carried out by proximate testing. Various factors can influence the chemical composition or nutrient content in fish meat besides genetics, age, season, environment, and also feed which is a nutrient intake for fish can also affect the chemical composition or nutrient content of fish meat. Data from the test results for the chemical or proximate levels of presto lalawak and fresh lalawak fish are presented in (Figure 1).



(a)



(b)

Figure 1. Proximate Test Results of: (a) Presto Lalawak Fish, (b) Fresh Lalawak Fish.

The principle of water content analysis is the process of evaporation of water from a material by heating. Based on the results of the water content test, it was found that the presto moisture content of lalawak fish was 36.56% while the water content of fresh lalawak fish was 67.5%. There was a decrease in presto moisture content of lalawak fish, allegedly the effect of a long heating process with high temperatures. Heating will cause water outflow from the muscle tissue of fish meat. Denaturation can be caused by heating because it causes the water contained in food to evaporate.

The principle of analysis of ash content is the process of combustion of organic compounds so that inorganic residues are called ash. Measurement of ash content was determined by gravimetry. Based on the ash content test results, it was found that the prestige of the lalawak fish has an ash content of 4.78% while the fresh lalawak has as much as 4.36% ash content. An increase was noted in the ash levels at the presto of lalawak fish. Increased ash content along with decreasing presto moisture content of fish due to ash content is an inorganic substance which is a residue of mineral elements such as water and other organic materials.

The principle of analysis of protein content of total nitrogen is the process of releasing nitrogen from proteins in samples using sulfuric acid by heating. Determination of protein content from total nitrogen using the Kjeldahl micro method. Presto lalawak fish has a protein content of 29.68% while the protein content of fresh lalawak is 19.3%. Fish is an excellent source of protein for the body, because it has a high protein content and essential amino acid content which is almost entirely needed by the human body. The increase that occurs in the presto of lalawak fish is due to the long heating process with high temperatures and pressures.

The protein content of presto products of fish has increased due to the use of high temperatures, because of the expenditure of water from fish meat which causes protein to be more concentrated and compared to fresh fish, the protein content of presto products has increased.

The principle of fat content analysis is extraction, which is the separation of fat from the sample by circulating hexane solvents into the sample, so that other compounds cannot dissolve in the solvent. The method used in fat analysis is Soxhlet extraction method. Warming causes fat loss because of the formation of volatile carbonyl compounds, ketone acids, exposure acids, and so on. Based on the results of the fat content test it was found that the prestige of the lalawak fish had a fat content of 12.66% while the fresh lalawak had a fat content of 6.54%. Generally after the processing of food there will be damage to the fat contained in it. The level of damage varies greatly depending on the temperature used and the length of time of the processing process, the higher the temperature used, the greater the fat damage. The difference between presto fat content of lalawak fish and fresh lalawak fish is thought to be due to the difference in lalawak fish catch season itself, so there is a possibility that the lalawak fish before dipresto have higher fat content.

Based on the test results on carbohydrate levels by using the difference method it was found that the carbohydrate content in the lalawak fish presto had a large yield of 16.32% while the carbohydrate content of fresh lalawak was 2.3%. There was an increase in carbohydrate levels of lalawak fish after processing the fish presto. The increase in carbohydrates is suspected because the analysis uses a rough calculation method or also called carbohydrate by difference. Carbohydrate levels are strongly influenced by the levels of other nutrients because carbohydrate levels are calculated using the difference method, which is by reducing 100% with water, ash, protein, and fat content obtained from proximate analysis. Calculations using the method by difference do not show actual results, only close because there are still other nutrients in a very small amount and there are still unanalyzed ones.

Fish bone is one part of fish that has a large amount of calcium among other parts of the body of the fish, because the main elements of fish bones are calcium, phosphorus, and carbonate. Testing of calcium levels in the prestige of lalawak fish is based on the results of the assessment of the panelists' preference for the fish tested. Based on the results of the favored test, it was found that the prestige of the lalawak fish with a heating time of 120 minutes was the most preferred presto of the fish, so this treatment would be carried out for testing calcium levels. Based on the proximate test results of calcium levels, it was found that the calcium values contained in the presto of lalawak fish were 127.4 mg / 100g, while the results of the calcium concentration test for milkfish were 1422 mg / 100g according to data from the Ministry of Health of the Republic of Indonesia in 2005. Fish bones have calcium (5.63 g / kg) and phosphorus (2.38 g / kg). Recommended nutrition for calcium is 500-800 mg / day. These results indicate that the lalawak fish presto cannot meet the calcium requirement per day when consuming 100 g of lalawak fish presto, so that fulfilling calcium per day needs to be balanced with foods containing calcium such as milk.

4. CONCLUSIONS

Presto lalawak fish with all treatments are still favored by panelists. Presto fish with a 120-minute warm-up treatment produced the prestige of the lalawak fish which the panelists preferred. Weight criteria are as follows: for appearance 10%, aroma 17%, taste 56%, and

texture 16%. Priority values of treatment were 60 minutes, 90 minutes, and 120 minutes respectively, namely 33%; 33%; and 34%. The proximate test results of presto lalawak fish with 120 minutes treatment are: for water content 35.56%, ash 4.78%, protein 29.68%, fat 12.66%, calcium 127.4 mg / 100g, and carbohydrates 16.32%.

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