Asian Journal of Fisheries and Aquatic Research

Volume 21, Issue 1, Page 11-18, 2023; Article no.AJFAR.95380
ISSN: 2582-3760

Modification of Protein Hydrolyzate of Snakehead Fish as an Ingredient for Instant Seasoning Coto Makassar

Sri Udayana Tartar [a*], Muhammad Fitri [a] and Ikbal Syukroni [b]

[a] Department of Agroindustry, Pangkep State Polytechnic of Agriculture, 90655, Pangkajene and Kepulauan Regency, South Sulawesi, Indonesia.
[b] Department of Aquatic Product Processing and Storage, Pangkep State Polytechnic of Agriculture, 90655, Pangkajene and Kepulauan Regency, South Sulawesi, Indonesia.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJFAR/2023/v21i1525

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/95380

Original Research Article

Received: 20/10/2022
Accepted: 28/12/2022
Published: 10/01/2023

ABSTRACT

Aim: This study aimed to determine the ratio formula for the hydrolyzate of snakehead fish head flour and Instant seasoning flour of Coto Makassar.
Study Design: The experimental design used was using an independent t test (independent t-test) namely (Coto Seasoning Flour: HPKIG Flour) / (TC: THPKIG) as follows A = (TC: THPKIG) = 90% : 10% (b /b) and B= (TC: THPKIG) = 80% : 20% (w/b).
Place and Duration of Study: The research had carried out from May 2018 to August 2019, the production of the hydrolyzate of snakehead fish head protein is Coto Makassar seasoning had committed in the Chemistry Laboratory of Agro-industry Study Program, Pangkep State Agricultural Polytechnic, hydrolyzed snakehead fish head protein flour using the spray dryer drying method had brought about at the Center for Plantation Products in Makassar. The physicochemical analysis

**Corresponding author: Email: sriudayanatartar@gmail.com;*

had done in the Chemical Laboratory, Department of Fisheries Product Processing Technology, Pangkep State Agricultural Polytechnic. Amino acid profile tests using the Ultra Performance Liquid Chromatography (UPLC) method were tested at the Saraswanti Indo Genetec Bogor laboratory. and analysis of volatile compounds had carried out at the Research Center for Flavor Analysis Laboratory of Rice Plants Sukamandi, Subang.

Methodology: The third research is the result of a study of Coto makassar seasoning flour products with the best protein to be applied to Coto Makassar seasoning flour. Applications made were snakehead fish head protein hydrolyzate and Coto seasoning flour treated with a ratio of 100% (Coto Seasoning Flour: HPKIG Flour) / (TC: THPKIG) was as follows (TC: THPKIG)1 = 90%: 10% (w/b) and (TC: THPKIG)2 = 80% : 20% (w/b). The best treatment result was carried out by the preference test on the protein coto seasoning produced, namely the study of the best ratio formula of 20 grams dissolved in boiling water A = 150 mL, B = 200 mL C = 250 mL.

Results: Characteristics of the application of 20% snakehead fish head protein hydrolyzate flour and 80% coto seasoning flour obtained a brightness value of L* 59.23%, hue 67.13%, moisture content 10.19%, ash content 11.48%, protein content 64.20%, 1.26% fat content and 3.35% albumin content. The highest amino acid is glutamic acid 20.68%. Sensory value of taste sample application of fish head protein hydrolyzate in coto Makassar seasoning 20% with the addition of 200 mL of water Assessment criteria 8 (Very like) panelists prefer it because it feels the more spicy sensation

Conclusion: The result of the analysis obtained by the best treatment are the characteristics of the application of 20% hydrolyzed protein from snakehead fish head flour and 80% coto seasoning flour.

Keywords: Amino acid; coto; fish head; Makassar; snakehead.

1. INTRODUCTION

Snakehead fish (*Channa striata*) is a predatory fish native to Indonesian waters. The spread of snakehead fish is almost evenly distributed throughout Indonesia from Sabang to Merauke. Snakehead fish also has many regional names such as bocek fish (Riau), cursed fish (Java), haruan (Kalimantan), bale salo/bale perforated (Bugis), kanjilo (Makassar), gastor (Sentani Papua) and others [1]. Snakehead fish has essential amino acids and non-essential amino acids where glutamic acid 14.25%, arginine 8.67%, and aspartic acid 9.57% are more dominant amino acids [2]. The content of glutamate snakehead fish is 14.15 100 g AA [3]. Aside was dish, snakehead fish can be processed into various processed products such as pempek, kempalang crackers, dried fish, smoked fish, shredded fish, flour and health products [4]. Fish protein hydrolyzate can be added to non-allergenic infant formulas and dietary supplements, instant meals, soups, sauces or snacks. Fish protein hydrolyzate can also be used in the manufacture of dermatological products, such as facial cleansing creams and skin moisturizing creams [5].

Hydrolyzed snakehead fish head with the addition of enzymes will produce liquid hydrolyzate which has a savory taste. The delicious taste of the hydrolyzate of the snakehead fish head is due to the protein content of the snakehead fish which consists of essential amino acids and non-essential amino acids which can be used as a food ingredient. Meanwhile, the result of the analysis of amino acid composition showed that snakehead fish has the acid amino glutamic which indicates a potential source of lucious taste (umami) [6]. Therefore, it is necessary to develop processing technology from fish raw material into natural flavor that is safe and multipurpose.

The snakehead fish head hydrolyzate technological innovation under study will be applied as an ingredient in seasoning products. There are many ready-to-use broth available in the market, both in powder, block and liquid form in cans/cartons [7-9]. Ready-to-use stock on the market today is felt to only feature flavor strengthener that have the potential to cause cholesterol and hypertension due to the high salt and saturated fat content (Machbubatul, 2008) [10]. Flavor enhancer on the market is an additive compound used as a food additive to strengthen the taste of food. The flavor enhancer is consumed by the public in the form of L-glutamic acid with an average usage of around 0.6 g/kg BW. If you consume 30 mg/kg BW of flavor enhancers, glutamic acid levels in human blood will increase and exceed the body's

metabolic capacity. Excessive use of synthetic flavor enhancers can cause symptoms known as Chinese Syndrome, where the signs are headache, shortness of breath, sweaty face, tingling in the neck, jaw and back [11].

Protein hydrolyzate can be used to improve the characteristics of various food products and also as a flavor enhancer. Seasonings on the market today are sold in wet form which has a short shelf life. Processing of instant seasoning with the drying method extends the shelf life of the seasoning, minimizes processing, and makes serving more practical [12]. Instant seasoning is a mixture of several spices with a predetermined composition and can be used immediately as a seasoning. Hydrolyzate of snakehead fish protein as an ingredient in instant coto Makassar seasoning is an innovation to elevate the wisdom of local spices, namely instant coto Makassar seasoning as a culinary dish [13,14]. For social application, the result of research on snakehead fish protein hydrolosate as an instant seasoning ingredient for coto Makassar can be consumed by creating nutritious coto-flavored dishes using raw materials not from meat and organ meats [15].

The product of snakehead fish protein hydrolyzate as an ingredient for coto Makassar instant seasoning is very beneficial for the community because the level of activity of the people is increasing day by day and they want everything in instant form, including the need for seasonings that have a long lasting power, minimizing the processing process by speeding up the serving process.

2. MATERIALS AND METHODS

2.1 Materials

The material used is the head of a snakehead fish weighing 3 per kg obtained from Lake Tempe, Wajo Regency, South Sulawesi and the enzyme bromelain activity of enzyme 400,000 u/g min obtained in the Delta Malang laboratory produced by Xian Lyphar Biotech where the coto seasoning ingredient is red onion 24 %, garlic 23%, galangal 22%, lemongrass 22%, ginger 2%, coriander 1%, pepper 2%, cumin 0.5%, cinnamon 1%, cloves 0.5%, salt 1.5%, and sugar 0.5% obtained at the Pabaeng-baeng Makassar traditional market, distilled water, bottled packaging obtained at Intraco Makassar and the materials used in the analysis included n-Hexane and Ethyl acetate, 0.2% DPPH solution.

The tools used in the processing procedure are analytical balances (Sartorius TE 64), Memmert brand ovens, Shellab brand vacuum ovens, Spray drayer and chomameter (Monolta Camera CR-300).

2.2 Methods

The method of applying protein hydrolyzate to Makassar Instant coto seasoning is the first research on making protein hydrolyzate flour with the addition of maltodextrin, namely (HPI Snakehead Fish Head: Maltodextrin) 100% is the application of HPKIG: M_1 = 97.5: 2.5 (w/w) and treatment HP_IM_2 = 95: 5 (w/w) After adding maltodextrin as filler, it is dried in a spray dryer with an inlet temperature of 120^{o}C and an outlet temperature of 80^{o}C. The second research is to make instant coto Makassar formulations from observations of the specified seasoning formulations which are then ground then cooked for 30 minutes to reduce the water present in the spices. After cooking, the spices are stored in the container used in the same size. The size of the container used is H = 5 cm x P = 25 cm x W = 15 cm. The pasta spices were stored in a container with a height of 2 cm and then dried in a Shellab vacuum oven with a pressure of 1 atm with a drying temperature of 60°C until it reached a moisture content of 12% according to the SNI 01-3709-1995 spice powder standard. The third research is the result of a study of Coto makassar seasoning flour products with the best protein to be applied to Coto makassar seasoning flour. Applications were hydrolyzed snakehead protein flour and coto seasoning flour treated with a ratio of 100% (Coto Seasoning Flour: HPK_IG Flour) / (TC: $THPK_IG$) was as follows (TC: $THPK_IG)_1$ = 90% :10% (w/ b) and (TC: $THPK_IG)_2$ = 80% : 20% (w/b). The best treatment result were carried out by the preference test on the protein coto seasoning produced, namely the study of the best ratio formula of 20 grams dissolved in boiling water A = 150 mL, B = 200 mL C = 250 mL.

2.3 Experimental Design

The experimental design used in this study was to use an independent t-test (independent t-test).

2.4 Analysis Data

The research data were analyzed using analysis of variance using SPSS software.

3. RESULTS AND DISCUSSION

3.1 Physicochemical Characteristics of Hydrolyzed Snakehead Protein Flour Application in Coto Makassar Seasoning

Research on the physicochemical characteristics of the application of snakehead fish head protein hydrolyzate in Coto makassar seasoning was carried out by making a comparison formulation of snakehead fish head protein hydrolyzate in order to obtain protein coto seasoning. Protein coto seasoning which is a ready-to-eat seasoning will be applied to dishes that require protein intake. The average value of physicochemical analysis for the application of hydrolyzed snakehead protein flour in instant seasoning coto Makassar can be seen in Table 1.

One of the important thing in determining the quality and resistance of food to damage is the water content contained in the food. One way to reduce the water content in foodstuffs is drying, removing water using heat energy will minimize the possibility of the growth of fungi and destructive microorganisms. Instant seasoning coto makassar 20% gets the lowest value, namely 10.19%, the water content obtained is below the SNI 01-3709-1995 standard, which is 12%. The more mixed food ingredients are dried, the higher the water content obtained, likewise on the contrary. The drying air temperature will also affect the drying process. When the drying temperature is lower, it will slow the drying process down. The relationship between the ratio of the seasoning formulation and the drying temperature shows that the higher temperature used in the drying process, the lower water content contained in the seasoning. This is similar to research [16].

Ash content shows the total minerals in a food [16]. About 96% of food ingredients consist of organic matter and water and the rest is organic material in the form of a mineral called ash [17]. 20% got the highest score of 11.48%. The ash content obtained was higher than the SNI 01-3709-1995 standard, namely 7%, the total ash content of minerals in a food ingredient. Foodstuffs, which are about 96% consist of organic matter and water. The remainder consists of mineral elements. Mineral elements are also known as inorganic substances [18]. Ash content depends on the type of material, method of ashing, time and temperature used during drying [19].

The average value of the protein analysis ratio of Coto makassar seasoning flour 80% and 20% snakehead fish head protein hydrolyzate is 64.20%, for the lowest fat content obtained from the treatment of Coto makassar seasoning flour 80% and snakehead fish head protein hydrolysate 20 % is 1.26%. The low fat content was due to the comparison treatment factor of the two samples which were formulated using the drying method, namely the snakehead fish head protein hydrolyzate flour was powdered using the spray drayer method and the coto seasoning flour was dried in a vacuum oven [20], the fat content with a high drying temperature can be caused by a decrease in the water content so that the percentage of fat content in the sample increases. Moisture content and fat content have an inverse relationship, if the water content is higher, the fat content produced will decrease [20].

Based on the result of the analysis of the average value of physicochemical analysis of the comparison of hydrolyzed snakehead fish head protein flour and Instant Coto makassar seasoning flour where for albumin content it was found that the lowest mean value for albumin content was obtained from the treatment of 90% Coto makassar seasoning flour and hydrolyzed Snakehead fish head protein flour 10% which is 3.12%. and the highest was obtained from the treatment of coto Makassar seasoning flour 80% and 20% Snakehead fish head protein hydrolyzate flour, namely 3.35%.

The ratio of 90% coto seasoning flour and 10% hydrolyzed snakehead fish head flour got a brightness value of L* 36.83% while the ratio of 80% coto Makassar seasoning flour and 20% hydrolyzed snakehead fish head flour gained a value of 59.23%.

The color hue of the ratio of 90% coto Makassar seasoning flour and 10% hydrolyzate snakehead fish head flour acquired a color hue value of 76.43% while the ratio of 80% coto Makassar seasoning flour and 20% hydrolyzate snakehead fish head flour procured a value of 67.11%, stated brownish red because it is at a value of 0 to +100 the brownish red color is caused by a denaturation or oxidation process which can cause a brownish yellow color in the product.

Table 1. Result of physicochemical analysis of hydrolyzed snakehead protein flour application in instant coto makassar seasoning

Component	Comparison of Coto Seasoning Flour and Snakehead Fish Head Hydrolyzed Flour (%)	
	(90:10)	(80: 20)
Water content	11.50	10.19
Ash Content	10.35	11.48
Protein Content	52.39	64.20
Fat level	1.45	1.26
Albumin Levels	3.12	3.35
L Brightness Level	36.83	59.23
Color Hue	76.43	67.11

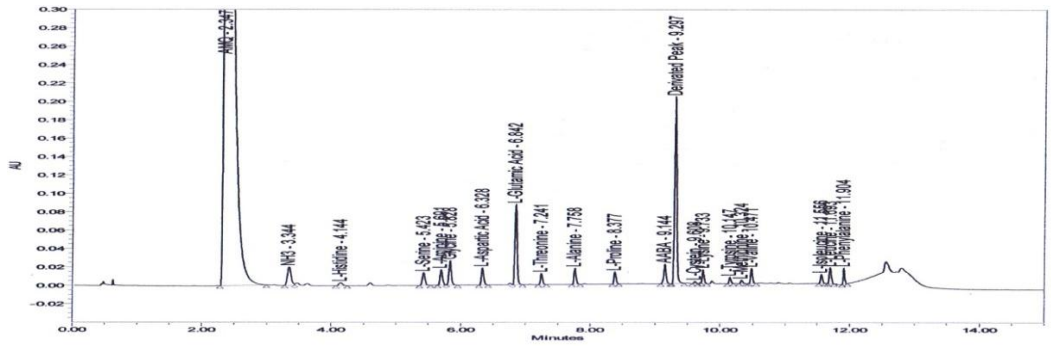
3.2 Amino Acid Levels Application of Hydrolyzed Snakehead Protein Flour in Coto Makassar Seasoning

The quality of protein can be determined based on the content of the essential amino acids that compose it. In principle, a protein that can provide essential amino acids in a composition that almost matches human needs is a high-quality protein [21]. Hydrolysis that processes perfectly will produce a hydrolyzate consisting of a mixture of 18-20 kinds of amino acids [22]. Protein that are hydrolyzed will produce amino acids, but there are some proteins that in addition to producing amino acids also produce protein molecules that are still bound [23].

The profile of Amino acid application of snakehead fish head protein hydrolyzate in Coto makassar seasoning. The highest non-essential amino acid hydrolyzed of snakehead protein was glutamic acid 20.68%. contributed to giving meaty, or savory umami taste. If the glutamic acid content found in fish meat is low, the taste of fish meat will be less delicious [24], Arginine 6.48%, [10], salty taste [20]. Amino acids serine 4.50% and theonin 3.55% which give a sweet taste and phenylalanine 7.25%, are amino acids that play a role in enhancing the aroma (flavor enhancer) in fishery products. Valina 4.33%, leucine 5.35% and histidine 1.93% are known to give a bitter taste [25].

The highest amino acid contained in the application of snakehead fish head protein hydrolyzate in Coto makassar seasoning flour is glutamic acid having a protein content under the criteria for flavor enhancer raw materials based on [26]., namely 75.25%. Amino acids directly occupied an important rule and contributed to flavor and taste and can be a precursor for aromatic components [27]. Seeing with in realities, this research has potentially to be applied as a flavoring or flavor enhancer.

Based on amino acid chromatography of hydrolyzed snakehead protein application in coto Makassar seasoning using the UPLC method showed a peak retention time of 9,297 minutes, while glutamate amino acid retention time was 6,842 minutes. Compared to the standard amino acid analysis, the peak compound retention time is 9,292 minutes, while the retention time for glutamic amino acid is 6,841 minutes.



Retention Time (minutes)

Fig. 1. Chromatography of amino acid analysis application of hydrolyzed snakehead protein flour in instant coto makassar seasoning

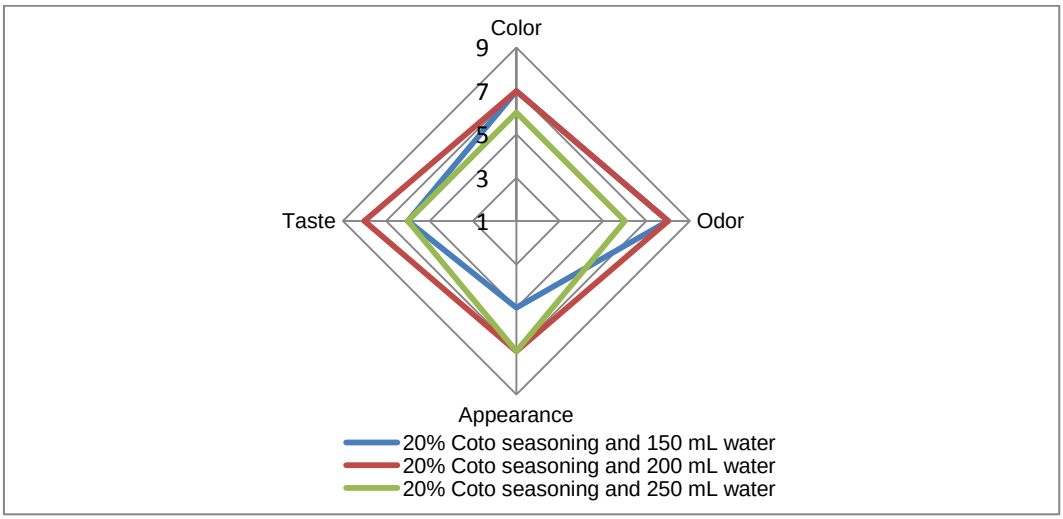


Fig. 2. Sensory test formulation application of hydrolyzed snakehead protein powder in instant coto makassar seasoning flour

3.3 Sensory Test Application of Hydrolyzed Snakehead Protein Flour in Coto Makassar Seasoning

The sensory test used in this study was to use a preference test which included color, aroma, appearance and taste. Sensory testing used 22 panelists. The best treatment from the result of physicochemical analysis that will be tested sensory is the application of 20% snakehead fish head protein hydrolyzate flour: 80% coto Makassar seasoning flour. To obtain the broth formulation for the application of snakehead fish head protein hydrolyzate in Coto makassar seasoning, an sensory test was carried out by varying the 20 percent hydrolyzate application seasoning for snakehead fish head protein in Coto makassar seasoning - 150 mL, 200 mL and 250 mL boiling water, respectively.

Panelists were asked to determine their level of preference for the coto seasoning broth. For the taste preference test the panelists assessed the delicious taste, for the odor preference test each panelist simply smelled using the sense of smell, for the color preference test, each panelist only needed to see the appearance of color with the sense of sight and for the appearance of the panelists to see the precipitated spice solution. The level of preference test scale for taste, odor, color and appearance of each treatment by referring to the hedonic scale with a value range of 1 to 9.

Fig. 2 shows that the more water is added to the application sample of fish head protein hydrolyzate in Instant seasoning coto makassar the resulting color rating tends to be lower. The level of preference for this color is related to the Maillard product which is a reaction that forms a brown color. The color assessment of the sample obtained criterion 7 (liked), namely the addition of 150 mL of water and 200 mL of odor from the application of fish head protein hydrolyzate in Coto makassar seasoning tended to decrease as the amount of water added decreased. The odor assessment on the sample is getting criterion 8 (very like). Appearance is seen whether there is seasoning that settles in the container after administration of water sample application of fish head protein hydrolyzate in coto makassar seasoning ranging from 5 - 7 (neutral - like).

Taste value of the sample application of snakehead fish head protein hydrolyzate in Coto makassar seasoning adding 200 mL of water Assessment criteria 8 (Very like) panelists prefer it because it feels more like the sensation of the spice than the taste of the hydrolyzate of the fish while for the addition of 150 mL of water it tends to get a somewhat liking rating criterion because the spice tastes salty.

4. CONCLUSION

The characteristics of the application of 20% snakehead fish protein hydrolyzate flour and 80% coto seasoning flour obtained a brightness value of L* 59.23%, hue 67.13%, water content 10.19%, ash content 11.48%, protein content 64, 20%, 1.26% fat content and 3.35% albumin content. The highest amino acid is glutamic acid

20.68%. Sensory value of taste sample application of fish head protein hydrolyzate in coto Makassar seasoning 20% with the addition of 200 mL of water Assessment criteria 8 (Very like) panelists prefer it because it feels more spicy sensation.

ACKNOWLEDGEMENTS

The author would like to thank the Ministry of Education, Culture, Research and Technology and the Pangkep State Agricultural Polytechnic, as well as the Director and Chair of PPPM Pangkep State Agricultural Polytechnic, Indonesia and to all parties who have assisted in the implementation of this research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Asfar M, Tawali AB, Abdullah N, Mahendradatta M. Extraction of albumin of snakehead fish (*Channa striatus*) in producing the fish protein concentrate (FPC). IJSTR. 2014;3.
2. Wongso S, Yamanaka H. Extractive components of the adductor muscle of Japanese baking scallops and changes during refrigerated storage. J Food Sci. 1998;63(5):772-6.
DOI: 10.1111/j.1365-2621.1998.tb17897.x
3. Gam LH, Chiuan L, Yee B. Saringat. Amino acid composition of snakehead fish (*Channa striatus*) of various sizes obtained at different times of the year. Malays J Pharm Sci (MJPS). 2005;3(2):19-30.
4. Muslim M. Lebak Lebung Swamp fishery, south Sumatra. 1st ed. Palembang: Unsri Press; 2012.
5. Pigot GM, Tucker BW. Utility fish flesh effectively while maintaining nutritional qualities. Seafood effects of technology on nutrition. New York: Marcel Dekker, Inc; 1990.
6. Witono Y, Siti Windrati W, Taruna I, Afriliana A, Assadam A. Production and characterization of protein hydrolyzate from ”Bibisan fish” (*Apogon albimaculosus*) as an indigenous flavor by enzymatic digital Jember university repository Jember university digital repository 62Hydrolysis. Adv J Food Sci Technol. 2014;6(12): 1348-55.
DOI: 10.19026/ajfst.6.209
7. Indonesian national standard. Chemical test method SNI 01-2354-2006. Jakarta, (ID): National Standardization Body; 2006.
8. Mohd SM, Abdul Manan MJ. Therapeutic potential of the Haruan (*Channa striatus*): From food to medicinal uses. Malays J Nutr. 2012;18(1):125-36.
PMID 23713236.
9. Zuhra S, Erlina C. Effect of operating conditions of a spray dryer on the quality of corn milk powder. J Chem Environ Eng. 2012;9(1):36-44.
10. Ovissipour M, Benjakul S, Safari R, Motamedzadegan A. Fish protein hydrolysates production from yellowfin tuna Thunnus albacares head using alcalase and protamex. Int Aquat Res. 2010;2:87-95.
11. Budiasih KS. Chemicals in the household. Delivered in Broadcast on Radio MQ FM. Yogyakarta State University; 2015.
12. Pedersen. Removing bitterness from protein hydrolysates. Inside: Food Industry X. Chicago: Institute of Food Technologists USA; 1994.
13. Maga JA. Umami flavor of meat. In: Shahidi F, editor. Flavor of meat, meat products and seafoods. London: Blackie Academic & Professional. 1998;197-215.
14. Primary RI. Flavor Characteristics Some Smoked Fish Indones [thesis]. Bogor, (ID): Bogor Agricultural University; 2011.
15. Hambali E, Fatmawati, Permanik R. Making dry instant spices. Jakarta: Independent Spreader; 2005.
16. Riansyah A, Supriadi A, Nopianti R. Effect of differences in temperature and drying time on the characteristics of sepat Asam salted fish (*Trichogaster pectoralis*) using an oven. Fishtech [journal]. 2013;2(1):53-68.
17. Feringo T. Analysis of water content, ash content, acid insoluble ash content and fat content in snacks at the Research Institute and Medan industry standardization. University of Northern Sumatra; 2019.
18. Winarno. Food enzymes. Jakarta: PT. Main library Gramedia; 1995.
19. Sudarmadji. Food microbiology. Yogyakarta: UGM Press; 1989.
20. Zhao CJ, Schieber A, Gänzle MG. Formation of taste-active amino acids, amino acid derivatives and peptides in food fermentations – A review. Food Res Int. 2016;89(1):39-47.

DOI: 10.1016/j.foodres.2016.08.042, PMID 28460929.

21. Damodaran S. Amino acids, peptides and protein. Inside. In: Fennema OR, editor. Food chemistry. 3rd ed. New York: Marcel Dekker, Inc; 1996.
22. Cholifah. Hydrolyzed production and characterization of snapper offal (*Lates calcarifer*). Essay; 2014.
23. Kurniawan S Lestari, Hanggita SRJ. Squid Ink Protein Hydrolysis (Loligo sp.) With Papain Enzyme. Fishtech. 2012;1(1):41-54.
24. Suryaningrum. Suryaningrum DT, Muljanah I, Tahapari E. Sensory profile and nutritional value of several types of catfish and nasutu hybrids. J Postharvest Mar Fish Biotechnol. 2010;5:153-64.
25. Kato H, Rhue MR, Nishimura T. The role of free amino acids and peptides in food taste. In: Teranishi R, editor. Chemical flavors; trends and developments. Inside Communications; 1989.
26. Thaddee I Lyraz. In: Seafood flavorants produced by enzymatic hydrolysis. Proceedings of the international by-product conference; Alaska. 1990;197-201.
27. Özden Ö. Changes in amino acid and fatty acid composition during the shelf life of marinated fish. J Sci Food Agric. 2005;85(12):2015-20.
DOI: 10.1002/jsfa.2207

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/95380