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THE EFFECT OF ADDING MORINGA (*MORINGA OLEIFERA*) LEAF EXTRACT ON THE CHEMICAL COMPOSITION CHANGES OF SNAKEHEADS FISH (*CHANNA STRIATA*) CRACKERS

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ABSTRACT

The product of processing snakehead fish into crackers by adding moringa leaf extract (*Moringa oleifera*) is the latest innovation in making food ingredients that can increase the nutrients, protein and fiber in the resulting snakehead fish crackers. This research aims to increase the added value of snakehead fish crackers by adding moringa leaf extract in the processing process.

KEY WORDS

Crackers, snakehead fish, moringa leaves, fat content, protein content, fatty acid profile, amino acid profile.

The potential of snakehead fish (*Channa striata*) in South Kalimantan is quite abundant, snakehead fish has chewy, white flesh, does not cause allergies so it can be made into crackers with a delicious/savory taste (Fajri, 1997). Based on the potential and nutritional content of snakehead fish, it is an opportunity to be used as the main ingredient in producing crackers. Fish crackers are a dry food product made from flour by adding fish meat and additional ingredients such as sugar, egg white, salt and garlic (Elyawati, 1997). Crackers are a dry food that contains quite high starch, which is made from tapioca flour as a base ingredient.

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MATERIALS AND METHODS OF RESEARCH

The tools used are freezers, steaming pans, knives, basins, cutting boards, trays, scales, stoves, napkins, chemical test analysis tools. The ingredients used are snakehead fish meat, moringa leaves, tapioca flour, water, fine salt, granulated sugar, flavorings, eggs, cooking oil, and ingredients used to analyze fat content and fatty acid profile.

Moringa leaf extracts processing procedure:

- Selection/Sorting of moringa Leaves. The moringa leaves selected for extract were 150 grams of dark green so that the color was real green. Then separate the leaves from the leaf twigs;
- Washing moringa Leaves. After the moringa leaves have been sorted properly, then the moringa leaves that will be used are washed until clean. This is to avoid any other ingredients/something getting into the moringa leaf extract later. It is best to wash it with running water so that the dirt on the moringa leaves can be dissolved by the water;
- Weighing moringa Leaves. The next step, after ensuring that the moringa leaves are clean, is to weigh 150 grams of moringa leaves. It is best to weigh the moringa leaves correctly so that the results will be as expected;



- Extraction Process. The method for obtaining moringa leaf extraction is the pressing method; the pressing method is by processing the weighed moringa leaves into a blender and adding liquid ingredients in the same amount as the weight of Moringa, namely 150 ml. The extraction process is stopped when the moringa leaves dissolve into the liquid and become dregs;
 - Filtering. Moringa leaves that have been blended with liquid ingredients, the next stage – separation. The separation stage is done by separating the moringa leaf dregs from the moringa leaf extract. The tool used to separate it is using a filter cloth.
- Fish cracker processing procedure:
- The toman fish is weeded by removing the head and entrails, then washed with water until clean;
 - The next process is that the toman fish meat is separated from the skin and bones by slicing lengthwise with a knife on the back to obtain a fish fillet shape;
 - The toman fish meat which is already in fillet form is then ground until smooth, after that it is weighed according to what is needed, each treatment is 1:1 of the toman fish meat which has been ground with flour and mashed yellow pumpkin;
 - Next, add spices such as 2.5% salt, 5% garlic to each treatment and treatment O uses 100% tapioca flour, treatment A 90%, and treatment B 80% tapioca flour. The next stage is stirred until homogeneous;
 - Add previously mashed steamed yellow pumpkin to treatment A 10% and treatment B 20% respectively;
 - The dough is then formed into lenjer;
 - Then, boil for 10 minutes until cooked at a temperature of 100 C.

The method used in this research was a completely randomized design (RAL). According to Srigandono (1981), a Completely Randomized Design is the simplest design both in technique and analysis. This design is used to determine and compare the effects of various treatments. This study had 4 treatments with 4 repetitions as follows:

- Treatment O = Snakehead fish crackers without adding moringa leaf extract;
- Treatment A = Snakehead fish crackers with moringa leaf extract (10 ml);
- Treatment B = snakehead fish crackers with moringa leaf extract (20 ml);
- Treatment C = snakehead fish crackers with moringa leaf extract (30 ml).

The test parameters in this study were the water content, protein content, amino acid profile, fat content and fatty acid profile of toman fish crackers with the addition of moringa leaf extract.

RESULTS AND DISCUSSION

Based on the results of the protein content test, it shows that the differences between treatments are very significant. The highest protein content treatment was found in C with a range of 10.75 and treatment O received the lowest value compared to treatments A, B, and C (Figure 1).

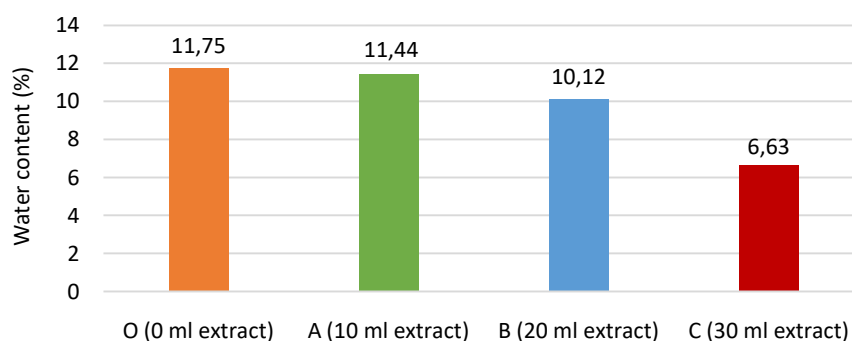


Figure 1 – Graph of Water Content of Snakehead Fish Crackers with Addition of moringa leaf Extract



The addition of moringa leaf extract used greatly influences the protein content produced in snakehead fish crackers. The protein content in each treatment tended to increase along with the addition of higher levels of moringa leaf extract. Treatment C, which used additional concentration of moringa leaf extract, increased the protein content of Snakehead fish crackers the most. Meanwhile, processing without the addition of moringa leaf extract and using the same processing process caused a decrease in the protein content in the snakehead fish crackers produced.

The protein content of snakehead fish crackers with the addition of moringa leaf extract in the study from all treatments was 9.33%, namely a minimum of 5%. This is due to the addition of moringa leaf extract which is mixed in the processing of snakehead fish crackers. The more moringa leaf extract added to the cracker ingredients, the higher the protein content in snakehead fish crackers.

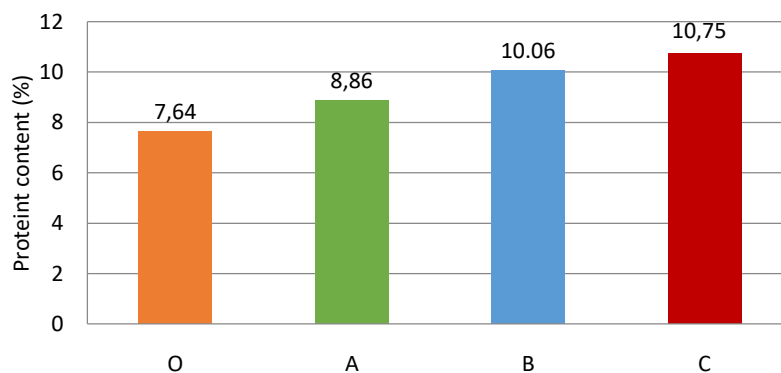


Figure 2 – Graph of Protein Content Test Value for Snakehead Fish Crackers with the Addition of moringa Leaf Extract

Table 1 – Amino Acid Profile of Snakehead Fish Crackers with the Addition of moringa Extract

No.	Amino Acids	O (Control)	A (10 ml)	B (20 ml)	C (30 ml)
Essential					
1	Isoleusin	0.49	0.55	0.50	0.44
2	Leusin	0.82	0.86	0.81	0.73
3	Lisin	1.29	1.41	1.02	1.19
4	Metionin	0.17	0.25	0.18	0.15
5	Fenilalanin	0.45	0.49	0.43	0.53
6	Tirosin	0.15	0.22	0.10	0.12
7	Histidin	0.21	0.24	0.22	0.19
8	Treonin	0.45	0.49	0.43	0.34
9	Valin	0.48	0.54	0.48	0.42
Total of Amino Acids esential (%)		4,51%	5.05%	4.17%	4.11%
Non Essential					
10	Alanin	0,67	0.72	0.63	0.46
11	Arginin	0,52	0.61	0.49	0.46
12	Aspartat Acid	1,10	1.15	1.02	0.90
13	Glutamat Acid	1,78	1.93	1.77	1.59
14	Glisin	0,50	0.51	0.4	0.38
15	Serin	0,39	0.41	0.36	0.35
Total of Amino Acids non esential (%)		4,96%	5.33%	4.67%	4.14%

Providing moringa leaf extract can increase the amino acid profile of snakehead fish crackers, the more moringa leaf extract is given to snakehead fish crackers, the more the amino acid profile contained will increase. However, based on the data that has been analyzed, it shows that snakehead fish crackers without the addition of moringa leaf extract have a higher among of amino acid compared to those given 20 ml and 30 ml of moringa leaf extract. The total amino acid content decreased in the treatment of adding 20 ml of



moringa leaf extract to processing snakehead fish crackers and the treatment of adding 30 ml of moringa leaf extract to processing snakehead fish to processing snakehead fish crackers. The total number of amino acids decreased, it is thought that this was due to the presence of amino acids that were soluble in water along with the large to processing snakehead fish crackers. The total number of amino acids decreases, it thought that was due to the presence of amino acids that were soluble in water along with the large amount of water that came out after cooking process for a long time and the structure of the amino acids that changed due to the effect of gradual heating, namely the cooking process followed by drying.

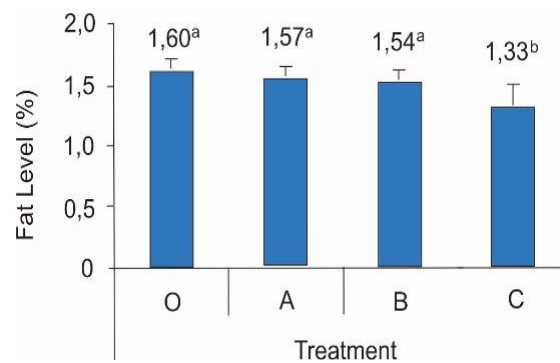


Figure 3 – Graph of analysis results for the fat content of snakehead fish crackers with the addition of moringa leaf extract (Note: Numbers followed by different superscript letters (a and b) indicate that the treatments are significantly different at the 5% confidence level)

The highest fat content of snakehead fish crackers was in treatment O 1.60% (control) without the addition of moringa leaf extract, followed by treatment A 1.57%, B 1.54% and the lowest fat content was in treatment C 1.33%. Based on Duncan's further tests, it was found that the fat content of snakehead fish crackers with the addition of moringa leaf extract between treatments O-A, O-B, A-B, was not significantly different, whereas between treatments A-C and B-C it was significantly different, and between treatments O-C it was very significantly different.

Analysis of the fatty acid profile of snakehead fish (*Channa striata*) crackers with the addition of moringa oleifera leaf extract showed that 32 types of fatty acids were identified. However, there are also fatty acids that are not present in some treatments and are only present in other treatments. The highest fatty acid found in snakehead fish crackers with the addition of moringa leaves in treatments O, A, and B is palmitic acid which is included in saturated fatty acids (SFA), while in treatment C the highest fatty acid content is Cis-10 acid pentadecanoate is included in the monounsaturated fatty acid (MUFA) group.

CONCLUSION

The treatment of adding moringa leaf extract to the processing of snakehead fish crackers had a very significant effect on the fat content of fish crackers. The lowest fat content was in treatment C (30 ml moringa leaf extract), followed by treatment B 1.54% (20 ml moringa leaf extract), treatment A 1.57% with the addition of 10 ml moringa leaf extract and the highest in treatment O 1.60% (control) without adding moringa leaf extract. Analysis of the fatty acid profile of snakehead fish crackers with the addition of moringa leaf extract showed that 32 types of fatty acids were identified, which were classified as saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). The highest fatty acid found in snakehead fish crackers with the addition of moringa leaves in treatments O, A, and B is palmitic acid which is included in saturated fatty acids (SFA), while in treatment C the highest fatty acid content is Cis-10 acid pentadecanoate is included in the monounsaturated fatty acid (MUFA) group. The moringa leaf extract affects the water content of snakehead fish crackers the highest water content was in treatment O followed by A, B,



and C. For protein content the highest were in treatment C followed by B, A, and O. For fat content the lowest fat content was in treatment C, followed by treatment B 1.54 %, treatment A 1.57% and the highest in treatment O 1.60% (control). Analysis of the fatty acid profile of snakehead fish crackers with the addition of moringa leaf extract showed that 32 types of fatty acids were identified. The highest fatty acids in treatments O, A, and B, is palmitic acid which is included in the saturated fatty acid (SFA), while in treatment C the highest fatty acid content is Cis-10-Pentadecanoic acid which is included in the fatty acid group monounsaturated (MUFA). The moringa leaf extract affects the amino acid pattern where for the highest essential amino acid is lysine and the non-essential one is glutamic acid.

Further research is needed regarding the use of moringa leaf extract to add nutritional value to these foods. Researchers are also expected to be able to use more modern equipment to make the research process easier.

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