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ANALYSIS OF NUTRIENT LEVELS IN LAIS FISH (KRYPTOTERUS SP) AS A POTENTIAL LOCAL FOOD SOURCE TO PREVENT STUNTING.

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Abstract: Stunting indicates impaired growth in children under the age of five due to chronic malnutrition, especially during the first 1000 days of life. The existence of complementary feeding can complement the nutritional needs of children. Complementary foods are transitional foods from breast milk to foods consumed by the family slowly. Fish contains vitamins and proteins that are more abundant than beef or goat. The potential of fisheries in East Kalimantan Province is quite high, so people can easily get animal protein sources such as fish. There are various types of fish caught by fishermen in the Mahakam River. Three types of local fish that are often caught by fishermen are Cork Fish (Channa Striata), Lais Fish (Cryptoterus sp.) and Betok Fish (Anabas testudineus). This study aims to determine the content in lais fish (kryptoterus sp) as a potential local food source to prevent stunting. This research is an experimental study with an Intac-group comparison approach. Simple random sampling technique. Based on the results of the study, the percentage of lais fish meat content for 24-hour treatment is water (96.4%), protein (2.16%), fat (2.45%), carbohydrates (1.28%) and ash (0.27%). The 48-hour treatment contained water (94.1%), protein (13.31%), fat (3.7%), carbohydrates (11.87%) and ash (0.76%). The 72-hour treatment was water content (82.14%), protein (22.56%), fat (1.89%), carbohydrates (8.78%) and ash (2.19%).

Keywords: Lais Fish, Nutrition, Proximate Test

1. Introduction

The golden period (first 1000 days of life) is the most important period in stunting prevention, starting from the fetus in the womb until the child is 2 years old (Dwi Astuti et al., 2020). Therefore, nutritional improvement must be prioritized in the first 1000 days of life, namely 270 days during pregnancy and 730 days in the first life of the baby who is born. Food intake during pregnancy is not the same as the intake before pregnancy, based on the nutritional adequacy rate, an additional 300 kcal per day is needed during pregnancy (Astuti, D. P., & Sulastri, E., 2019). Protein requirements increase by 20 grams/day; fat by 10 grams/day and carbohydrates by 40 grams/day during pregnancy (Ekayanthi & Suryani, 2019). Increasing the age of the baby will increase the nutritional needs of the body, babies need 55 kcal for metabolism which decreases to 25-30 kcal after adulthood. babies in the growth phase need 20-

40 kcal/kg in the first days, but decreases until reaching infancy under five years to 15-25 kcal/kg per day (Widyaningrum et al., 2021).

Malnutrition in infants under five years causes the fat layer under the skin to decrease as the body utilizes available fat reserves (Mardihani & Husain, 2021). The immune system and albumin production also decrease, so infants under five years are more susceptible to infection and experience a slowdown in growth and development (Damongilala, 2021). undernourished infants under five years will increase the acid-base of the gastrointestinal tract, causing diarrhea (Susanti, 2023). Complementary feeding can complement children's nutritional needs (Ramdhani et al., 2020). Complementary feeding is a transition food from breast milk to food consumed by the family slowly (Yulianti & Astari, 2020). This transition includes gradual adjustments to the type of food, frequency of administration, portion of food, and form of food according to the age and digestive capacity of the baby (Lestiarini & Sulistyorini, 2020). Fish is more abundant in vitamins and protein than beef or mutton. Using fish as a source of nutrient-rich protein is an effective strategy to prevent growth and development disorders in children (Handayani, 2022).

2. Materials and Methods

This research is an experimental research with the Intac-Group Comparison approach conducted at the Fishery Product Technology Laboratory, Faculty of Fisheries and Marine Science, Mulawarman University in November 2023. The population in this study was Lais fish (Kryptoterus sp) found in Semayang Lake, Kutai Kartanegara Regency which had a normal body weight of 100-250 grams, and the length had reached between 12-29 cm. The sampling method used in this study is probability sampling with simple random sampling technique. The sample in this study is the meat of Lais Fish (Kryptoterus sp) which is given the treatment of different proximate test times according to the criteria of Lais Fish meat (Kryptoterus sp) which has been separated by skin and bones measuring about 100 g/sample group. Group 1 is a fish meat preparation that is in a freezer for 24 hours, Group 2 is a fish meat preparation that is in a refrigerator for 48 hours, and Group 3 is a fish meat preparation in a refrigerator for 72 hours. This study used 3 sample groups and conducted 3 repetitions of treatment in each group. Proximate test was conducted by calculating the moisture, ash, protein, fat, and carbohydrate content. The data that has been collected will be processed using Microsoft Excel and SPSS 2016 with repeated measures anova test to determine the nutritional content contained in Lais Fish (Kryptoterus sp) with a variable time of 24 hours, 48 hours, and 72 hours.

3. Results and Discussion

The results of the analysis of the chemical composition of food are very important to obtain information about the nutritional content contained therein. One of the methods used to determine the chemical composition of food ingredients is proximate analysis, which includes moisture, ash, protein, fat and carbohydrate content.

Table 1. Results of Proximate Analysis of Lais Meat

Compotitions	Lais Fish (Kryptoterus sp)		
	24 hour	48 hour	72 hour
Moisture	96,40%	94,10%	82,10%
Ash	0,27%	0,76%	2,19%
Protein	2,16%	13,30%	22,50%
Fat	2,45%	3,70%	1,89%
Carbohydrate	1,28%	11,80%	8,78%

The content of ingredients in products is an important parameter for people in considering the selection of food to be consumed.

3.1 Moisture Content

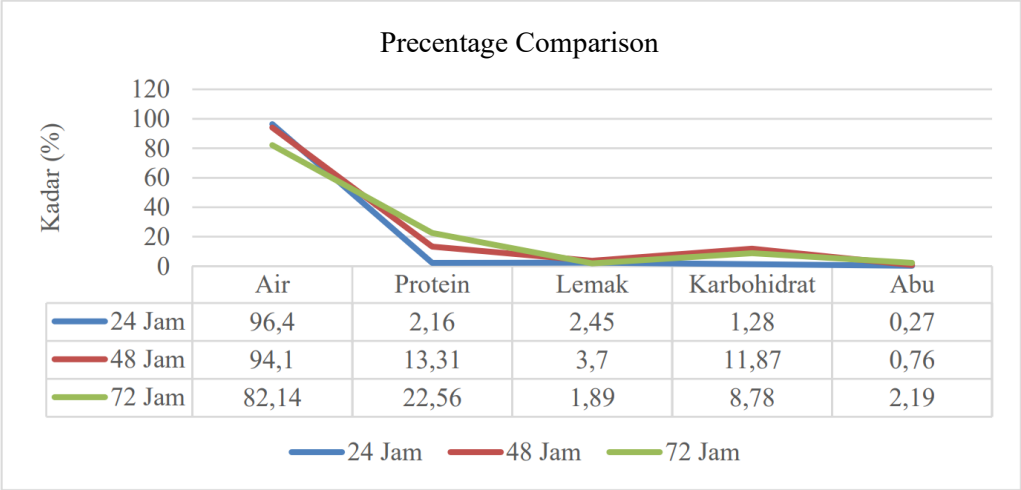

Fig. 1. Percentage of moisture content

Analysis of water content was carried out to determine the amount of free water contained in lais fish meat. The water content in lais fish shows the highest percentage compared to ash, protein, fat, and carbohydrate content. Based on the results of the study, the value of water content of lais fish meat tested with fish meat 24 hours, frozen 48 hours, and frozen 72 hours showed insignificant differences in water content can be seen in the following graph plots.

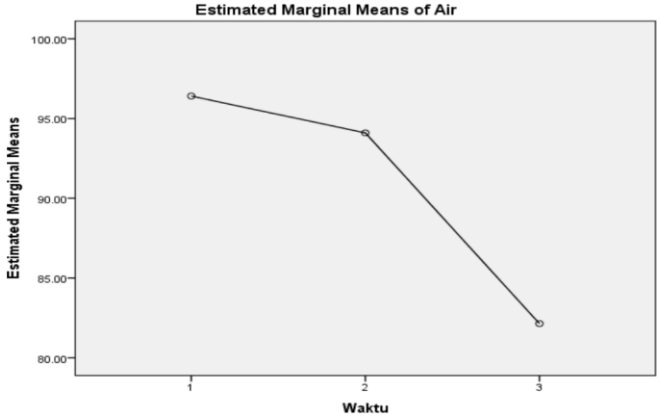

Fig. 2. Profile Plots of Water

The moisture content contained in lais meat changes in proportion in each treatment from 96.4% (24 hours frozen lais meat), 94.1% (48 hours frozen) and 82.14% (72 hours frozen).

Table 2. Mauchly's Test of Sphericity of Water

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	0,001	6,544	2	0,038	0,500	0,501	0,500

However, the static results of the Repeated Measure ANOVA test show that the sig result on mauchly's test of sphericity is <0.05. Furthermore, after knowing the sig value of Mauchly's test of sphericity, look at the Greenhouse-Geisser result value. This result can be seen from table 3.

Table 3. Tests of Within-Subjects Effect of Water

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Sphericity Assumed	351,725	2	175, 863	6,072	0,061
	Greenhouse-Geisser	351,725	1,001	351,472	6,072	0,133
	Huynh-Feldt	351,725	1,003	350,715	6,072	0,132
	Lower-bound	351,725	1,000	351,725	6,072	0,133
Error (Time)	Sphericity Assumed	115,856	4	28,964		
	Greenhouse-Geisser	115,856	2,001	57,886		
	Huynh-Feldt	115,856	2,006	57,762		
	Lower-bound	115,856	2,000	57,928		

In the Greenhouse-Geisser results, the sig value is 0.133 which means the p value> 0.05. This shows that from the statistical results there is no significant difference in water content in the proximate test carried out with the treatment of freezing for 24 hours, 48 hours and 72 hours. The comparison between the 24-hour, 48-hour and 72-hour treatments can be seen in Table 4 on Pairwise Comparision.

Table 4. Pairwise Comparisons of Water

Time (I)	Time (J)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	2,307	6,081	1,000	-44,204	48,817
	3	14,263	1,938	0,054	-0,560	29,087
2	1	-2,307	6,081	1,000	-48,817	44,204
	3	11,957	4,147	0,307	-19,762	43,675
3	1	-14,263	1,938	0,054	-29,087	0,560
	2	-11,957	4,147	0,307	-43,675	19,762

These results show that the treatment can reduce the water content in fish meat with an average decrease in the 48-hour treatment of 2.30% and 14.2% within 72 hours.

3.2 Ash Content

The ash content of a food can show the amount of minerals contained in the material. Based on the results of the study, the ash content of lais meat that had been frozen for 24 hours, frozen for 48 hours, and frozen for 72 hours showed significant differences in ash content. showed a significant difference in ash content which can be seen in the following graph plots.

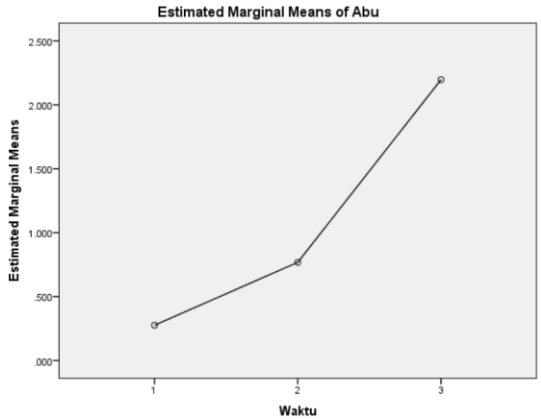

Fig. 3. Profile Plots of Ash

Table 5. Mauchly's Test of Sphericity of Ash

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	0,279	1,277	2	0,528	0,581	0,887	0,500

In the static results of the Repeated Measure ANOVA test, the sig result on Mauchly's test of sphericity is> 0.05. Furthermore, after knowing the sig value of mauchly's test of sphericity, look at the value of the test of within-subject effects results. This result can be seen from table 6.

Table 6. Tests of Within-Subjects Effect of Ash

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Sphericity Assumed	5,972	2	2,986	9,374	0,031
	Greenhouse-Geisser	5,972	1,162	5,139	9,374	0,077
	Huynh-Feldt	5,972	1,773	3,368	9,374	0,039
	Lower-bound	5,972	1,000	5,972	9,374	0,092
Error (Time)	Sphericity Assumed	1,274	4	0,319		
	Greenhouse-Geisser	1,274	2,324	0,548		
	Huynh-Feldt	1,274	3,547	0,359		
	Lower-bound	1,274	2,000	0,637		

In the test of within-subjects effects results, the sig value is 0.031, which means the p value is <0.05. This shows that from the statistical results there is a significant difference in ash content in the proximate test carried out by freezing treatment for 24 hours, 48 hours and 72 hours. The comparison between the 24-hour, 48-hour and 72-hour treatments can be seen in Table 7 on Pairwise Comparision.

Table 7. Pairwise Comparision of Ash

Time (I)	Time (J)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	-0,492	0,496	1,000	-4,286	3,302
	3	-1,921*	0,205	0,034	-3,489	-0,352
2	1	0,492	0,496	1,000	-3,302	4,286
	3	-1,429	0,591	0,410	-5,947	3,089
3	1	1,921*	0,205	0,034	0,352	3,489
	2	1,429	0,591	0,410	-3,089	5,947

These results show that the treatment can increase the ash content in fish meat with an average increase in the 48-hour treatment of 0.49% and 1.92% in 72 hours.

3.3 Protein Content

The protein content of lais fish meat tested with fish meat 24 hours, frozen 48 hours, and frozen 72 hours did not show significant differences in protein content which can be seen in the following graph plots.

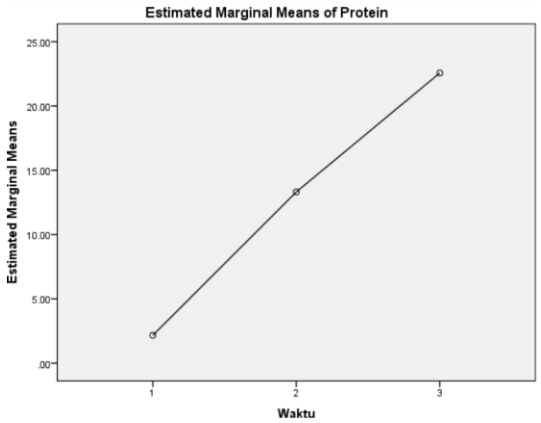

Fig. 4. Profile Plots of Protein

Protein levels in lais meat frozen for 24 hours, frozen for 48 hours and frozen for 72 hours showed no significant changes in protein levels. Protein levels in fish meat frozen for 24 hours were lower than those frozen for 72 hours.

Table 8. Mauchly's Test of Sphericity of Protein

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	0,128	2,054	2	0,358	0,534	0,647	0,500

In the static results of the Repeated Measure ANOVA test, the sig result on mauchly's test of sphericity is> 0.05. Furthermore, after knowing the sig value of mauchly's test of sphericity, look at the value of the test of within-subject effects results. This result can be seen from table 9.

Table 9. Tests of Within-Subjects Effect of Protein

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Sphericity Assumed	625,835	2	312,917	4,015	0,111
	Greenhouse-Geisser	625,835	1,069	585,702	4,015	0,176
	Huynh-Feldt	625,835	1,294	483,552	4,015	0,157
	Lower-bound	625,835	1,000	625,835	4,015	0,183
Error (Time)	Sphericity Assumed	311,716	4	77,929		
	Greenhouse-Geisser	311,716	2,137	145,863		
	Huynh-Feldt	311,716	2,588	120,424		
	Lower-bound	311,716	2,000	155,858		

In the results of the test of within-subjects effects shows the sig value is 0.111 which means that the p value> 0.05. this shows that from the statistical results there is no there is no significant difference in protein content in the proximate test. proximate test conducted with

freezing treatment for 24 hours, 48 hours and 72 hours. The comparison between the 24-hour, 48-hour and 72-hour treatments can be seen in Table 10 on Pairwise Comparision.

Table 10. Pairwise Comparisons of Protein

Time (I)	Time (J)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	-11,147	3,677	0,281	-39,273	16,980
	3	-20,397	9,839	0,522	-95,651	54,858
2	1	11,147	3,677	0,281	-16,980	39,273
	3	-9,250	6,748	0,912	-60,864	42,364
3	1	20,397	9,839	0,522	-54,858	95,651
	2	9,250	6,748	0,912	-42,364	60,864

The comparative results of the three treatments explained that in the freezing process it can increase about 9.25% within 24 hours and within 72 hours it increases about 20.3%.

3.4 Fat Content

Fat is one of the main components found in food besides carbohydrates and proteins. Therefore, the role of fat in determining the characteristics of food ingredients is quite large. A more effective source of energy than carbohydrates and protein is fat, one gram of fat can produce 9 kcal/gram of energy while carbohydrates and protein only produce 4 kcal/gram. Fat content in lais fish is 53.90% per 100 grams of fish meat. In fat content with the treatment of 24 hours frozen, 48 hours frozen, and 72 hours frozen has an influence on lais fish meat (Dewi et al., 2021).

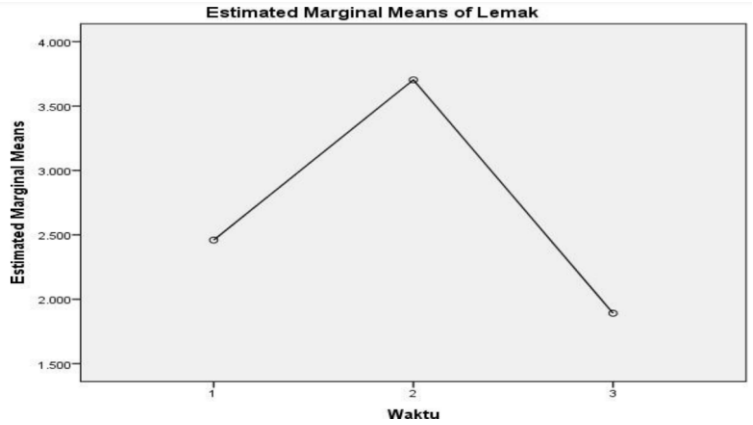

Fig. 5. Profile Plots of Fat

Figure 5 shows the fat content of fish meat frozen for 24 hours amounted to (2.45%) in 5 grams of fish meat.

Table 11. Mauchly's Test of Sphericity of Fat

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.	Epsilon[b]		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	0,791	0,234	2	0,889	0,827	1,000	0,500

In the static results of the Repeated Measure ANOVA test, the sig result on mauchly's test of sphericity is> 0.05. Furthermore, after knowing the sig value of mauchly's test of sphericity,

look at the value of the test of within-subject effects results. This result can be seen from table 12.

Table 12. Tests of Within-Subjects Effect of Fat

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Time	Sphericity Assumed	5,155	2	2,578	2,186	0,228
	Greenhouse-Geisser	5,155	1,654	3,116	2,186	0,244
	Huynh-Feldt	5,155	2,000	2,578	2,186	0,228
	Lower-bound	5,155	1,000	5,155	2,186	0,277
Error (Time)	Sphericity Assumed	4,715	4	1,179		
	Greenhouse-Geisser	4,715	3,309	1,425		
	Huynh-Feldt	4,715	4,000	1,179		
	Lower-bound	4,715	2,000	2,358		

In the results of the test of within-subjects effects, the sig value is 0.228, which means the p value> 0.05. This shows that from the statistical results there is no significant difference in fat content in the proximate test carried out by freezing treatment for 24 hours, 48 hours and 72 hours. The comparison between the 24-hour, 48-hour and 72-hour treatments can be seen in Table 13 on Pairwise Comparision.

Table 13. Pairwise Comparisons of Protein

Time (I)	Time (J)	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	-1,244	0,689	0,638	-6,511	4,023
	3	0,568	0,887	1,000	-6,218	7,355
2	1	1,244	0,689	0,638	-4,023	6,511
	3	1,812	1,047	0,677	-6,197	9,821
3	1	-0,568	0,887	1,000	-7,355	6,218
	2	-1,812	1,047	0,677	-9,821	6,197

The results of the three treatments can be seen that there is an increase in fat content in the 24-hour to 48-hour treatment. This increase is due to the oxygen reaction on saturated acids of fish fat. At 72 hours, it decreased due to the loss of triglyceride fraction caused by fat oxidation.

3.5 Carbohydrate

Based on the results of carbohydrate research in lais fish meat against the treatment frozen 24 hours with an average of 1.28% then followed by treatment frozen 48 hours with carbohydrate levels of 11.87%, after that in the treatment frozen 72 hours with carbohydrate levels of 8.78%. With the results will be presented in Figure 6.

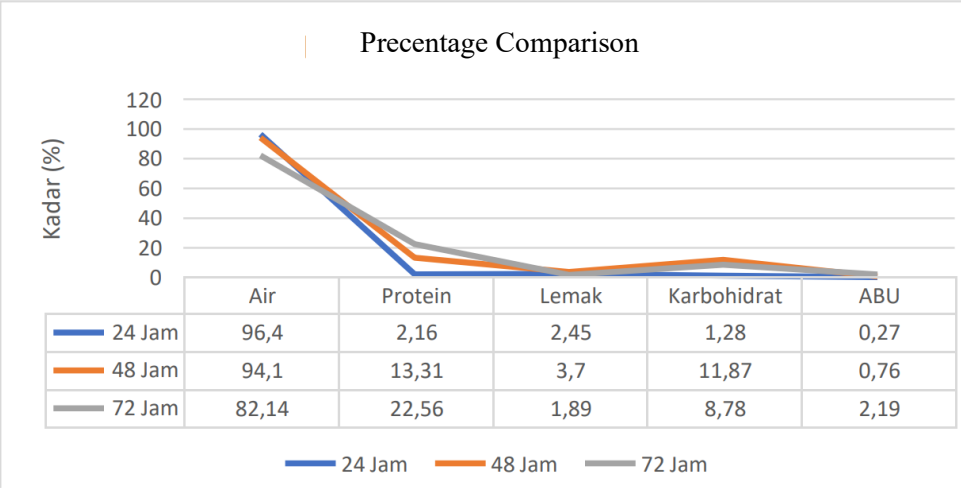

Fig. 6. Percentage of Carbohydrate Content

3.6 Interpretation of Results

This study uses the Proximate Test to determine the content contained in lais fish. Proximate analysis is the analysis of major components in foodstuffs and other agricultural products. Proximate analysis includes quantitative analysis of substance content: water, ash, fat, protein and carbohydrates. Analysis results are usually presented as levels in units of % (percent) (Kurniawan Alam Muza`ki, 2022).

3.6.1 Moisture Content

This difference in water content in each Lais fish meat is due to the ability of the material to bind water, called water holding capacity (WHC). Water molecules will bind through high-energy hydrogen bonds. High water content in fresh meat indicates water that is not bound in the tissue of a material or pure water. Not much different from the results of Betriana's research, namely there is a change in water content in tuna from 62.32% to 60.27%. The decrease in water content in fish meat is caused by storage temperature (Betriana, 2020). The decrease in water content that occurs in the storage process is due to product evaporation due to air temperature and environmental humidity where the product will absorb water when the room humidity is high and will evaporate in low room humidity (Setyastuti et al., 2022).

3.6.2 Ash Content

In the results of ash content analysis, there are differences caused by several factors, including season, size, maturity stage, environmental temperature and availability of food ingredients. Differences in chemical content also affect the ash content of food ingredients, differences in chemical composition can occur between species, between individuals within a species and between body parts with one another (Wijaya, 2019).

3.6.3 Protein Content

The difference in protein content can be caused by the length of freezing treatment which causes the fish meat protein to denature more easily. The protein content in each treatment increased during storage, indicating that the product protein decreased during cold storage. Protein levels in lais 51 fish meat with freezing treatment of 24 hours, 48 hours, and 72 hours

showed an increase in protein levels, this indicates that during storage there is an increase in protein levels in frozen products during storage due to protein denaturation (Fikriani,2022).

3.6.4 Fat Content

This fat value can be caused by differences in harvest age and metabolism of the organism. The increasing fat content is influenced by the increasing age of the fish, due to the physiological properties of the animal that will lead to the breeding phase of the animal. All types of fish samples, fat hydrolysis and oxidation can be described according to different quality indices related to damage and conclude that endogenous enzymes (hydrolytic and oxidative) are still active under storage conditions (Saidi et al., 2022).

3.6.5 Carbohydrate Content

The percentage results in Lais Fish meat with a sample weight of 5 grams are 1.28% (meat frozen 24 hours), 11.87% (meat frozen 48 hours), and 8.78% (frozen 72 hours). In this carbohydrate analysis, there is a difference in percentage, this difference is caused by an increase in other proximate levels. Groups or fractions of food values that include water, ash, protein and fat content (Anugrah, 2019).

4. Conclusion

There were no significant differences in water, protein and fat content between the 24-hour, 48-hour and 72-hour treatments. There are significant differences in ash content in the 24-hour, 48-hour and 72-hour treatments. At 24 hours freezing, the protein content of lais meat was 43.2 kcal (10.8 grams of fish meat), the fat content was 49 kcal (5.4 grams of fish meat) and the carbohydrate content was 25.5 kcal (6.2 grams of fish meat). At 48 hours of freezing, the protein content in lais meat amounted to 266.2 kcal (66.5 grams of fish meat), fat content amounted to 74 kcal (8.2 grams of fish meat) and carbohydrate content amounted to 237.2 kcal (59.3 grams of fish meat). At 72 hours freezing, the protein content of lais dahing was 451.2 kcal (112.8 grams of fish meat), fat content was 36 kcal (4 grams of fish meat) and carbohydrate content was 175.6 kcal (43.9 grams of fish meat).

Acknowledgements

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Conflict of Interest

All Authors declare no conflict of interest and agree with the content of the manuscript.

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