

Nutritional content of lobster (*Cherax quadricarinatus*) from Lake Toba

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ABSTRACT

Lobster (*C. quadricarinatus*) is a type of freshwater shrimp that only live-in fresh water and has a relatively larger body size. Chemical composition of lobster may be affected by its living environment. This study aims to determine the nutritional composition of male and female lobsters from the waters Sukkean Village and the waters of Pangbatan Village, Samosir Regency, North Sumatra Province. Sampling was done by purposive sampling. The dried powder of lobster meat samples (as much as 250 grams per sample) was then tested for mineral content (Ca, K, Mg, Cu, Fe and Zn) and proximate testing (water, ash, fat, protein and carbohydrates). The mineral test results showed that the minerals in each sample were Ca (2430.57-5096.01) mg, K (1.12-1.73) %, Mg (1850.03-2401.53) mg, Cu (10.47-30.08) mg, Fe (20.71-33.25) mg and Zn (74.82-78.58) mg. While the results of the proximate test showed that the contents of water, ash, fat, protein and carbohydrates were respectively 5.12-7.88%, 6.48-7.38%, 3.27-4.17%, 80.61-83.29%, and 0.53-1.84%. Based on the results obtained, the highest nutritional content of lobster meat from the mineral and proximate tests was calcium (Ca) and protein.

Keywords: Lobster (*C. quadricarinatus*), mineral, nutritional composition, proximate

INTRODUCTION

Indonesia is a country that has quite potential aquatic habitats in the cultivation process, especially in lobster cultivation (*Cherax quadricarinatus*) (Tamima, 2014). Starting from 2002-2003, lobster cultivation experienced an increase (Hutabarat, 2015) in line with the increasing human need for lobsters, both in terms of quality and quantity. At this time, lobster cultivation is starting to become widespread in Indonesia with the aim of meeting market demand both domestically and overseas (Taufiq *et al.*, 2016). In 2022, Malaysia and Singapore are requesting lobster exports from Indonesia of 21 tons of lobster every month (Shukri, 2022). The lobster *C. quadricarinatus* is a species of decapod originating from northern Australia and southern Papua and has

become one of the most important crustacean species for cultivation purposes. This species is one of the largest freshwater decapod species, which has the following characteristics: matures early, and females can lay more than a thousand eggs in one brood and have wide environmental tolerance; the first pereopods in males have red spots and are very large; has cervical and branchiocardial grooves that merge laterally in the cephalothorax; the tail has a transparent membrane and no indication of suture; the genital of male no calcification and more complex; the male genitals have an open fifth pereopod base, while the female genitals have an open third pereopod base; appearance of three pairs of rostrum spines; the body color of adult specimens is usually dark blue with cream and red/ brown spots,

with red leg joints (Eprilurahman et al, 2021; Haubrock, 2021; Arias & Torralba-Burrial, 2021). Lobster (*C. quadricarinatus*) which belongs to the group of freshwater shrimp (crustaceae) has several international names including crawfish and crawdad (Zaky et al., 2020), Australian crawfish, Australian red claw crayfish, freshwater blueclaw crayfish, freshwater crayfish, North Queensland yabby, Queensland redclaw, red claw, red claw crayfish, redclaw, tropical blue crayfish (CABI, 2023).

One of the freshwater ecosystems that really supports the sustainability of freshwater shrimp is a lake (Daryanto et al., 2015). Lake Toba, which is located in North Sumatra Province, is an important aquatic natural resource when viewed from its ecological function. This is because there are many freshwater organisms that live in it, including freshwater fish, freshwater shrimp and microbiota, especially plankton (Sianipar et al., 2022). The increasing demand for lobsters (*C. quadricarinatus*) has caused this shrimp species to become one of the commodities that is widely cultivated in the world of fisheries (Syamsunarno et al., 2019). For example, cultivation has been carried out by Hastuti et al (2024), Nur et al (2023), Subchan et al (2024), Safir (2023), Razanah et al (2020), and Lesmana (2022). Apart from being easy to develop, the costs involved in cultivating lobsters (*C. quadricarinatus*) are also very economical (Ernawati et al., 2021).

The increasing demand for lobsters for consumption means that the nutrients they contain are of concern to consumers. Nutrition or nutritional content is the constituent elements of food that can provide benefits to humans (Tari et al., 2018). The amount of nutrients contained in the body of a specimen varies. This may be caused by food intake or the supply of food sources for the organism.

Previous research conducted by Verdian et al. (2019) stated that the composition

contained in the meat of Vanamei shrimp and Tiger shrimp consists of water, protein, fat, carbohydrates, ash and crude fiber. However, research regarding the nutritional composition of freshwater lobsters (*C. quadricarinatus*) especially those from Lake Toba are very rarely reported. Therefore, it is necessary to conduct research on freshwater lobsters. This research aims to determine the nutritional composition of male and female lobsters originating from the waters of Sukkean Village and the waters of Pangbatas Village, Samosir Regency, North Sumatra Province.

METHOD

Sample data collection

Sampling was carried out from June to October 2021 in the waters of Sukkean Village and the waters of Pangambatan Village, Samosir Regency, North Sumatra Province.

Sample Preparation

Samples of *C. quadricarinatus* were washed thoroughly using distilled water to remove the flesh. The meat is blended and dried using an oven at 40°C until dry (does not contain water). Lobster flour is labeled SJ (Male Sukkean), SB (Female Sukkean), PJ (Male Sukkean) and PB (Female Sukkean). The lobster meat flour has been labeled and sent to LPPT UGM to be analyzed for mineral content. Meanwhile, for the proximate test, lobster meat flour was sent to the Testing Laboratory, Department of Aquatic Products Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural Institute.

Sample Analysis

Analysis carried out on lobster meat flour includes: 1. analysis of mineral content consisting of Ca, K, Mg, Cu, Fe and Zn; 2. Proximate analysis consisting of testing water content, ash content, fat content, protein content and carbohydrate content, was carried out using the SNI 01-2891-1992 method; 3. testing carbohydrate levels based on by difference method.

RESULTS AND DISCUSSION

Test results for the macro and micro mineral composition of lobster meat flour through Atomic Absorption.

Mineral Content Analysis

Spectrophotometry (AAS) can be seen in Table 1.

Table 1. Test Results for Lobster Meat Meal Using the AAS Method

Sample	Sample Weight (gr)	Ca mg/Kg	K%	Mg mg/Kg	Cu mg/kg	Fe mg/kg	Zn mg/kg
SJ	2.0801	3394.16	1.73	2216.08	10.47	26.91	78.58
SB	2.1497	2430.57	1.12	1850.03	18.40	25.82	74.82
PJ	2.0313	4652.19	1.70	2331.27	18.66	33.25	78.23
PB	2.0310	5096.01	1.62	2401.53	30.08	20.71	77.13

The mineral composition samples tested in this study consisted of macrominerals, namely: Ca, K, Mg and microminerals consisting of Cu, Fe, Zn. Macro minerals are needed in large quantities for the formation of organs in the body, while microminerals are needed in small amounts to maintain the body's immunity. The results of mineral measurements in lobster (*C. quadricarinatus*) meat flour showed that the macro mineral range in each sample was Ca, 2430.57-5096.01 mg, K was 1.12-1.73%, Mg was 1850.03-2401.53 mg and the micro mineral range in each sample was Cu. Is 10.47-30.08 mg, Fe is

20.71-33.25 mg, Zn is 74.82-78.58 mg.

Based on research, potassium (K) is the mineral most abundantly contained in the body of lobsters (*C. quadricarinatus*). Potassium is a type of electrolyte that is important in helping regulate fluid balance in the body. Potassium also plays a role in regulating heart rate and muscle contractions. Consuming foods rich in potassium can help maintain proper electrolyte balance and reduce the risk of hypertension (Mahendra, 2023). Meanwhile, the smallest mineral content in the body of the lobster (*C. quadricarinatus*) is copper (Cu).

Proximate Analysis

Proximate analysis is a chemical analysis method used to identify the food content of a material. This analysis is used to analyze protein, ash, fat, water and carbohydrates,

which correlate with the nutritional value of food (Eden & Rumambarsari, 2019). The results of the proximate analysis in this research can be seen in Table 2.

Table 2. Results of Proximate Test Analysis

Analysis Parameter	Sample	Results (%)	
		Average	RPD
Water (%)	SB	5,12	0,39
	SJ	6,63	0
	PB	7,88	1,40
	PJ	6,62	0,60
Ash (%)	SB	6,48	1,70
	SJ	6,80	2,50
	PB	7,38	0,27
	PJ	7,38	0,27
Fat (%)	SB	3,27	0,31
	SJ	3,42	1,17
	PB	3,59	1,95

	PJ	4,17	1,20
Protein (%)	SB	83,29	0,23
	SJ	81,74	0,23
	PB	80,61	0,24
	PJ	81,11	0
Carbohydrate (%)	SB	1,84	3,79
	SJ	1,40	3,56
	PB	0,53	3,78
	PJ	0,72	2,78

Proximate analysis in this study was carried out to obtain the nutritional value contained in lobster meat flour which included analysis of water, ash, fat, protein and carbohydrate content.

Water is a very important component contained in food. Water affects the texture, quality and taste of food (Tari et al., 2018). The highest water content was found in female *C. quadricarinatus* obtained from Pangambatan Village (PB) and the lowest water content was found in female *C. quadricarinatus* obtained from Sukkean Village (SB) respectively 5.12% and 7.88%, while The water content in male *C. quadricarinatus* from the two villages was not much different, namely 6.63% and 6.62%. The difference in water content in each sample can be caused by the level of freshness of each sample. Nafsiyah et al (2018) in their research on the nutritional composition of *Anguilla bicolor bicolor* and *A. marmorata* stated that differences in water content could be caused by the environmental conditions of the fish habitat and the level of freshness of the samples during the preparation and testing process. Meanwhile, the high or low water content in shrimp meat is also influenced by the organism's ability to hold water, which is called water holding capacity (WHC) (Verdian, Witoko, & Aziz, 2021).

Male and female *C. quadricarinatus* obtained from Sukkean Village (SB and SJ) had ash content that was not much different, namely 6.48% and 6.80% respectively, slightly higher in the male sample. Similarly, male and female *C. quadricarinatus* obtained from Pangambatan Village (PB and PJ) also have ash

content that is not different and even has the same value, namely 7.38%. Based on the results, the ash content in the *C. quadricarinatus* sample obtained from Pangambatan Village was higher than the *C. quadricarinatus* sample obtained from Sukkean Village although it tended not to be much different. According to Nafsiyah et al (2018), the high and low levels of ash contained in an organism are influenced by the type of organism and the habitat of origin of each organism. The ash content test results obtained in this study were higher than the ash content of *C. quadricarinatus* which was cultivated in Italy under controlled environmental conditions containing an ash content of 1.30% (Mauro et al, 2024).

The highest fat content was contained in male *C. quadricarinatus* obtained from Pangambatan Village (PJ), namely 4.17%, while the lowest fat content was contained in female *C. quadricarinatus* obtained from Sukkean Village (SB), namely 3.27%. Fat is an element that acts as an energy source. Energy obtained from fat usually has twice the capacity compared to carbohydrates and protein. The differences in fat content in the body of *C. quadricarinatus* are influenced by the metabolic rate and age of an organism (Tari et al., 2018). The low fat content causes *C. quadricarinatus* to be popular with consumers (Sidharta et al, 2018).

The protein content contained in each *C. quadricarinatus* sample has different values. This difference is thought to be due to the type of food, the level of the organism's ability to digest food and the location of the

environment where the organism lives. This is supported by previous research conducted by [Nafsiyah et al \(2018\)](#) regarding the nutritional composition of eel fish, which states that protein content is influenced by type, feed, ability to digest feed and habitat. *C. quadricarinatus* is a freshwater organism that has a very high protein content. This can be seen in table 2 where the highest protein content is found in the female *C. quadricarinatus* sample obtained from Sukkean Village (SB), namely 83.29%, while the lowest protein content was found in the female *C. quadricarinatus* sample obtained from Pangambatan Village (PB), namely 80.61%. This protein level has a higher value than the standard of the Ministry of Health of the Republic of Indonesia in 2018, which has a standard of 62.6%. Freshwater lobsters are known as shrimp that are rich in protein, and are known to have a good source of important nutrients such as omega fatty acids and vitamins ([Abidin et al, 2023](#)). The protein content obtained is very high compared to female and male *C. quadricarinatus* cultivated in Johor, Malaysia, which contain 17.78% and 18.71% protein respectively ([Tee et al, 2022](#)). Protein has several important roles, including helping the process of forming enzymes, organ cells, and muscle cells. Apart from that, protein can also repair damaged cells, regulate metabolism, and be a source of energy ([Tari et al., 2018](#)).

Male and female *C. quadricarinatus* obtained from Sukkean Village had a higher carbohydrate content compared to male and female *C. quadricarinatus* obtained from Pangambatan Village. The female and male samples obtained from Sukkean Village had a carbohydrate content of 1.84% and 1.40%, respectively, while the female and male samples obtained from Pangambatan Village had a carbohydrate content of 0.53% and 0.72% respectively. The differences in carbohydrate content found in the body of *C. quadricarinatus* are thought to be influenced

by factors such as age, feed and metabolic rate. Based on previous research regarding the nutritional content of several types of shellfish, it was found that the differences in carbohydrates contained in each sample were influenced by several factors including age, food digested, metabolic rate, movement rate and gonad maturity level ([Tari et al, 2018](#)).

Biological macromolecules include large cellular components and can be obtained naturally and in abundance. Fats, carbohydrates and proteins are biological macromolecules that are very important for the growth and survival of living things and can modulate the pathophysiology of neurodegenerative disorders/ diseases ([Mauro et al., 2024](#)).

CONCLUSION

It can be concluded that the mineral composition of each sample is: Ca (2430.57-5096.01) mg, K (1.12-1.73) %, Mg (1850.03-2401.53) mg, Cu (10.47-30.08) mg, Fe (20.71-33.25) mg and Zn (74.82-78.58) mg. The proximates contained in the body are water (5.12-7.88) %, ash (6.48-7.38) %, fat (3.27-4.17) %, protein (80.61-83, 29) % and carbohydrates (0.53-1.84) %. The highest mineral and proximate content in lobster (*C. quadricarinatus*) is calcium (Ca) and protein.

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