

Characteristics of Minerals and Vitamin B₁₂ by Tiger Snails, Shellfish Snow, Meretrix Meretrix

Nurjanah Nurjanah*, Asadatun Abdullah, Taufik Hidayat, Indah Yulianti

Department of Aquatic Product Technology, Faculty of Fisheries and Marine Science Bogor Agricultural University, Bogor, West Java, Indonesia

Abstract

Mineral and vitamin B₁₂ are essential nutrients found in mollusks. The aimed study to determined the chemical composition, mineral and vitamin B₁₂ levels in the tiger snails (*Babylonia spirata* L.), shellfish snow (*Pholas dactylus* L.), and meretrix meretrix (*Meretrix meretrix* L.) which represents by caught. Mineral content was determined by AAS (Atomic Absorption spectro photometry), whereas vitamin B₁₂ was determined by HPLC method (High Performance Liquid Chromatography). Protein the most abundant components in all three samples, followed by carbohydrates, ash, and fat. Proximate levels in tiger snails meat was higher than the shellfish snow and meretrix meretrix. The highed content in all three samples was sodium, followed by potassium, magnesium, phosphorus, and calcium. Tiger snails have mineral content at similar amount. Shellfish snow contains at fairly good macro minerals and minerals containing iron and zinc which greater than the meretrix meretrix and tiger snails. Selenium was not detected in all three samples. Tiger snails contain vitamin B₁₂ for 16.58 µg/100g, meretrix meretrix 13.74 µg/100g, and shellfiss snow 5.04 µg/100g. Tiger snails, shellfish snow, and meretrix meretrix can be a good source of minerals and vitamin B₁₂.

Keywords

Babylonia Spirata, Mineral, Shellfish, Vitamin B₁₂

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1. Introduction

Fishery product is one of food productions contains a lot of nutrition; those are protein, fat, carbohydrate, vitamin, and mineral. One of fishery products contains essential nutrition is mollusk. Mollusk, especially shellfishes, is a fishery product with animal protein with category complete protein, and contains vitamin, which is fat-soluble as well as water-soluble. Shellfish is a mineral resource, namely iron (Fe), zinc (Zn), selenium (Se), calcium (Ca), potassium (K), phosphor (P) and Flour (F). The mineral from the fishery product can be absorbed by the body better than nuts and cereals. One of the vitamin contents in fishery products is vitamin B₁₂. Vitamin B₁₂ is an essential vitamin for body contained in terrestrial food with minimum amount (Almatsier 2006).

Mollusk often caught along with demersal fishes and became

a complementary catch. The lack of information regarding the nutrition in mollusk also causes less consumption demand and causes several mollusks to be complementary catch. Tiger snail, tofu shellfish, and snow shellfish are type of mollusk, which can potentially be developed, however the information regarding their nutritious are still limited.

The content of mineral and vitamin B₁₂ in tiger snail, tofu shellfish, and show shellfish has not been identified, therefore, it is recommended to conduct a testing regarding the nutrition, mineral and vitamin B₁₂ on those three biota in order to improve the consumption motive, identify the appropriate potential development and its use, and provide the reference of mineral and vitamin B₁₂ resources to fulfill the society needs, either it is consumed directly or extracted as a practical

*Corresponding author

E-mail address: inun_thp10@yahoo.com (N. Nurjanah), besthd22@gmail.com (N. Nurjanah)

supplement. This research aims to define mineral and vitamin B₁₂ content on tiger snail, tofu shellfish and snow shellfish, which are representing the complementary catch.

2. Methodology

2.1. Materials and Tools

The main component used in this research is the meat of tiger snail, snow shellfish and tofu shellfish purchased from MuaraAngke Fish Market, Jakarta. The tools used are thermometer, analytics scale, porcelain cup, oven, desiccator, reaction tube, Erlenmeyer glass, kjeldahl tube, soxhlettube, heater, decollator, buret and tanur. The mineral testing is done by using AAS (Atomic Absorption Spectrophotometer) tools. The analysis of vitamin B₁₂ uses HPLC (High Performance Liquid Chromatography) tools.

2.2. Scope of Research

This research is a descriptive study consists of several stages, those are sampling, morphology research, morphometric calculation, yield calculation, chemical analysis on tiger snails, snow shellfish and tofu shellfish consisting of proximate analysis (water level, fat, protein, carbohydrate, and ashes level) (AOAC 2005), mineral level analysis using AAS and Vitamin B₁₂ level analysis with HPLC.

Third samples from each of the tiger snail, snow shellfish and tofu shellfish, were taken randomly as a sample on morphology research, morphometric calculation and yield. The sample is divided into meat, offal and its shell. The sample of meat separated from its shell and its offal then tested upon its water level, fat, protein, carbohydrate, ashes, mineral and vitamin B₁₂.

3. Result and Discussion

3.1. The Characteristic of Tiger Snail, Snow Shellfish and Tofu Shellfish

Shellfishes are filter feeder biota. The size of one biota will determine its yield size. The shellfishes' size is affected by type and factor of growth, namely season, temperature, food, salinity, rapidness, and other environment chemical factors (Nurdin *et al.* 2006). The morphometric data of tiger snail, snow shellfish, and tofu shellfish were described Table 1. Tiger snail has approximately 4.16 cm length, and 2.87 cm width, 1.94 cm height and 16.6 g total weight. Snow shellfish has approximately 10.58cm length, and 3.32 cm width, 3.04 cm height and 58.1 g total weight. Tofu shellfish has approximately 4.26 cm length, and 3.60 cm width, 1.87 cm height and 20.9 g total weight.

Table 1. Size and Weight of Tofu Shellfish, Snow Shellfish and Tiger Snails.

Parameter	Tofu Shellfish	Snow Shellfish	Tiger Snail
Length (cm)	4.26±0.27	10.58±0.85	4.16±0.27
Width (cm)	3.60±0.31	3.32±0.27	2.87±0.17
Height (cm)	1.87±0.17	3.04±0.34	1.94±0.19
Total Weight (gram)	20.9±4.21	58.1±11.51	16.6±2.43

±(SD)

The fresh tiger snail has the highest yield on its shell, which is 67.03%, yield on meat of 21.81 % and yield on offal of 11.16 %. The fresh snow shellfish has the highest yield on its shell, which is 60.64 %, yield on meat of 15.48% and yield on offal of 23.88%. The fresh tofu shellfish has the highest yield on its shell, which is 67.44%, yield on meat of 14.38% and yield on offal of 18.18% (Table 2).

Table 2. Yield Tofu Shellfish, Snow Shellfish and Tiger Snail.

Yield	Tofu Shellfish (%)	Snow Shellfish (%)	Tiger Snail (%)
Meat	14.38	15.48	21.81
Offal	18.18	23.88	11.16
Shell	67.44	60.64	67.03

3.2. Chemical Composition

The chemical composition of meat from tiger snail, snow shellfish and tofu shellfish was described on table 3. The testing result showed that the water level contained in meat of tiger snail, snow shellfish and tofu shellfish were 78.44 %, 83.78 % and 79.98%, respectively. The water level of food can be affected by the habitat or the environment of those components (Suastuti, 2009).

Table 3. The Chemicals Composition of meat Tiger Snail, Snow Shellfish and Tofu Shellfish.

Type of Nutrition	Tiger Snail (%)	Snow Shellfish (%)	Tofu Shellfish (%)
Water	78.44	83.78	79.98
Fat	0.33	0.11	0.24
Protein	17.38	11.37	9.39
Ash	1.20	1.19	1.37
Carbohydrate	2.65	3.55	9.02

The greatest fat level found in tiger snail, which 0.33 %, followed by the tofu shellfish and snow shellfish with 0.24 % and 0.11 %, respectively. The protein level contained on the tiger snail was 17.38% followed by the snow shellfish and tofu shellfish with 11.37 % and 9.39 %, respectively.

This result showed that the ashes level in the tofu shellfish was bigger, which is 1.37%, compared to the ashes level in snow shellfish and tiger snail, which were 1.19% and 1.20%, respectively. On the other hand the level of carbohydrate in tiger snail was lower than snow shellfish and tofu shellfish were 2.65 %, 3.55 % and 9.02 %, respectively. The difference in chemical composition may due to the species, age, sex, available food, rate of metabolism, gonad maturity level and rate of movement (Nurjanah *et al.* 2005).

3.3. The Mineral Composition of Tiger Snail, Snow Shellfish and Tofu Shellfish

Mineral essence is one of components needed by living things aside from the carbohydrate, fat, protein, and vitamin, also known as an inorganic or ash level (Arifin, 2008). Mollusk is one of mineral resources. The mineral content on shellfishes is varied by the species, sex, ages, and habitat (Nurjanah *et al.*, 1999). The minerals content in tiger snail, tofu shellfish and snow shellfish is described on table 4.

The approximate minerals content on tiger snail, snow shellfish and tofu shellfish are as follows: magnesium of 3216.04 ppm, potassium of 1632.87 ppm, sodium of 662.07 ppm, calcium of 408.08 ppm and phosphor of 70.91 ppm. Tiger snail has quite balance minerals content. Tofu shellfish has biggermicro-minerals content than two other samples. The snow shellfish has good macro-minerals content and has the biggest iron and zinc mineral than two other samples, which are 121.09 ppm, and 24.60 ppm. The difference on the mineral level on those three samples is affected by the species, sex, ages, habitat, season, and available food (Nurjanah *et al.*, 1999).

Table 4. The Macro and Micro Minerals Content on Tiger Snails, Tofu Shellfish and Snow Shellfish (mg/100g bk).

Type of Mineral	Tiger Snail (ppm)	Tofu Shellfish (ppm)	Snow Shellfish (ppm)
Macro Mineral			
Ca	764.75	239.02	220.48
K	1894.17	1386.06	1618.38
Mg	1886.38	664.19	440.74
Na	2481.23	2799.72	4367.20
P	677.83	575.46	732.93
Micro Mineral			
Fe	13.13	78.52	121.09
Zn	24.24	20.82	24.60
Cu	11.52	12.92	2.90
Se	Undetected	Undetected	Undetected

The mineral level also affected by the protein and fat level on sample. Almost all the mineral ion connected to the protein, and fat is known to affect the storing capacity on the organic metal as it has big affinity towards lipida (Nurjanah *et al.* 1999). Certain accumulated mineral on shellfish body is likely to decrease as the shell is increasing (Auburohim, 2006). The accumulated mineral is also affected by the saturated level of the organism in accumulating certain minerals; it can affect how much the mineral content on one organism (Cheney *et al.*, 2007). The micro mineral level on the meat of tiger snail, tofu shellfish and snow shellfish are approximately Fe (70.91 ppm), followed by Zn (23.22 ppm), Cu (9.11 ppm) and Se is undetected. Minerals, Cu, Fe, Zn and Se were used as an anti-oxidant (Nurjanah *et al.*, 2005).

The difference on the mineral level of an organism can be caused by the differences on the type of food consumed and

the condition of its habitat. The minerals content found in a water biota is affected by its food as well as its ability to absorb the mineral content on its habitat (Suprapti, 2008).

3.4. The Vitamin B12 Composition on Tiger Snail, Snow Shellfish and Tofu Shellfish

Vitamin B12 is a water-soluble vitamin that is essential for body. Vitamin B12 (cobalamin) is one of vitamins much found on fishery products. Vitamin B12 consists of cobalt and cyanide chain. Cobalt can be found on soil and sea sediment. The sea sediment contains more cobalt due to the soil erosion factor, which finally ends up in sea (Suprapti, 2008). The eating habit of shellfishes, which is filter feeder causes cobalt on sea sediment enters the biota's colon and converted into vitamin B12 by the help of bacteria. Vitamin B12 is needed to change folate, maintain the central neurotic system, cofactor in sintetasemetionin enzyme and homosistein enzyme, as well as smoothen the metabolism process (Almatsier, 2006). The testing results of the content of vitamin B12 on tiger snail, snow shellfish, and tofu shellfish are described in table 5.

Table 5. The Content of Vitamin B12 in Tiger Snail, Snow Shellfish and Tofu Shellfish.

Content	Tiger Snail	Snow Shellfish	Tofu Shellfish	Standard of daily needs*
Vitamin B ₁₂ (µg/100g)	16.58	5.04	13.74	1.0

*Almatsier, 2006

The result shows that those three samples contain vitamin B12 with adequate amount to fulfill the daily needs of vitamin B12 for body. Vitamin B12 can be much found on fishery products, amongst others include sardine (14.4 µg/100g), bendeng (3.4 µg/100g), tuna (3.0 µg/100g), kembung (2.5 µg/100g) and shellfishes (Almatsier, 2006). Based on the data, there is a potential that those three samples can be a good source for Vitamin B12 as the amount is quite big. Vitamin B12 (cobalamin) is one of vitamins found in fishery products especially in filter feederbiota. This is because there is cobalt on sea sediment enters into alimentary canal on filter feederbiota. Vitamin B12 is constructed from the synthesis of bacteria on colon, which later stored in liver. Human needs vitamin B12 from outside as the vitamin B12 constructed from the synthesis of bacteria on human occurred in colon, and therefore cannot be absorbed. Human can get vitamin B12 by consuming liver, fish, kidney, egg, milk and meat (Winarno, 2008)

4. Conclusion

Tiger snail, tofu shellfish and snow shellfish are group of mollusk that has potential to be developed. The highest minerals content on those three samples is magnesium,

followed by potassium, sodium, calcium and phosphor. Tiger snail has the balance mineral composition. Tiger snail contains vitamin B12 more than tofu shellfish and snow shellfish. Tiger snail, snow shellfish and tofu shellfish can be good mineral and vitamin B12 resources.

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