

## Amino Acids Content of *Anadara indica* at Garapan and Cibungur Rivermouths, Banten Province, Indonesia

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**Abstract** Amino acid is one of organic compounds that are biologically important for human. Cockles have been used as amino acid alternative source in fulfilling daily diet. *Anadara indica* is one of cockles that widely found in Southeast Asia and yet, where content amino acid in this cockle has been studied. This research is aimed to investigate the content of amino acid in *Anadara indica*. Samples were collected from Garapan and Cibungur rivermouths using “garoo”. Samples then grouped into small, medium, and large categories based on their shell length. Amino acid content was measured using High Performance Liquid Chromatography (HPLC). Arginine have higher concentration compared to other essential amino acids which was 1.86 %, while among non essential amino acid, glutamate acid has the highest concentration, which was 2.51 %. As consideration of food source, this cockle is very potential.

**Keywords** Essential amino acids; nonessential amino acids; cockles; *Anadara indica*, food source

## Introduction

Amino acid is one of components that build protein in animal. All of them are divided into two groups, essential and non essential amino acids (Sitompul 2004). According to Hames and Hooper (2005), examples of essential amino acids are histidine, arginine, treonine, valine, methionine, isoleucine, leucine, phenylalanine, lysine, tryptophan, while for the nonessential ones are aspartic acid, glutamic acid, serine, glycine, alanine, proline, tyrosine, and cysteine.

Cockles have rich nutrient content and excellent for food source. Beside that, they are also sold as high commodity, either in local or international market. According to Syahfril et al. (2004), *Anadara* is one of cockles that often consumed. This genus apparently become alternative protein source since their meat contain high protein and have a good taste (Satrioajie et al. 2013). Budiawan (2013) stated *Anadara indica* often consumed by low class up to higher class society and have been directly caught by local fishermen.

Some studies about amino acids content in bivalves has been reported by some reseachers. Hidayat (2011) found that in meat and organs of *Anadara antiquata*, arginine become the most prominent compared to other essential amino acids. The content of arginine in meat was 0.83% and 0.57% in organs. Glutamate acid was the highest one for nonessential amino acid which were 1.74% in meat and 1.22% in organs. Chairunissah (2011) reported the same result too, that arginin and glutamate acid existed in high concentration on three mussels, *Meretrix meretrix*, *Pholas dactylus*, and *Babylonia spirata*.

Information about amino acid content in *Anadara indica* is very few. It is very important to investigate content of amino acids in this cockle for it is a good source of protein for societies need.

## Material and Methods

### Sampling Site

Sampling was carried out in Garapan and Cibungur. Garapan is situated in Tanjung Pasir, Tangerang, Banten, while, Cibungur is located in Panimbang, Pandeglang, Banten (Figure 1). There are four stations in each rivermouth that were chosen randomly.

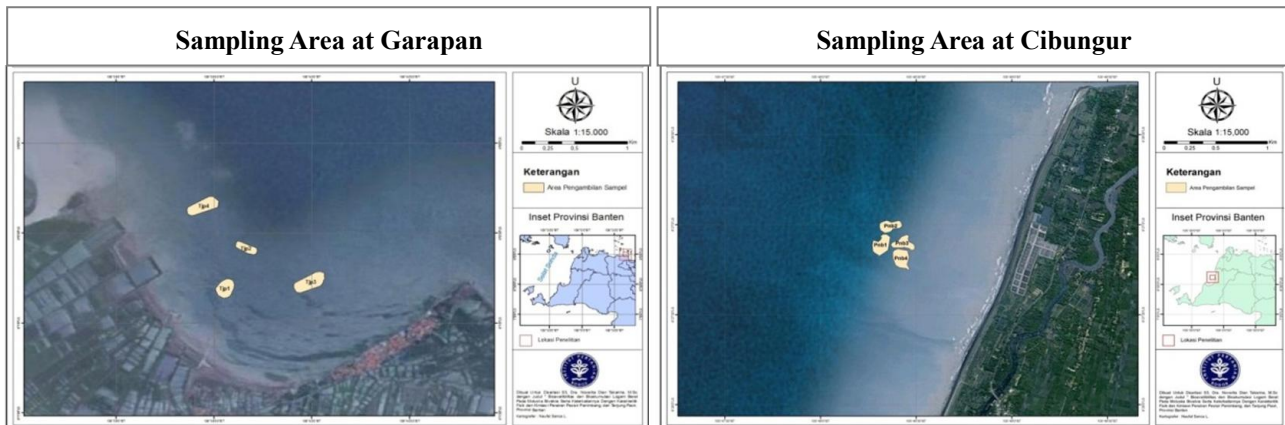


Figure 1 Sampling Sites, Garapan Rivermouth (left) and Cibungur Rivermouth (right)

### Sampling and Grouping *Anadara indica*

*Anadara indica* were collected using garoo. After that, samples were sorted based on their shell length into small (<31.80 mm), medium (31.80-38.90 mm), and large (>38.90 mm). Sample then stored for further analysis.

### Amino Acid Measurement

Content of amino acid in cockles were measured using High Performance Liquid Chromatography in Saraswanti Indo Genetech (SIG) Laboratory. All amino acid were analyzed based on Association of Official Analytical Chemists (AOAC) (2005).

Amino Acid standard solution. 40  $\mu$ l standard was mixed with amino acid, then added with 40  $\mu$ l AABA standard internal and 920  $\mu$ l aquabidest. Solution then homogenized and from this, took 10  $\mu$ l standard solution. After that, it was added sequentially with 70  $\mu$ l Acc-Q-Flour Borate, vortexed and added with 20  $\mu$ l Flour A reagent and vortexed again, then allowed to stand for 1 minute, incubated for 10 minutes at 55 °C then injected to HPLC.

Sample solution. 0.1 gr sample was added with 5 ml HCl, then vortexed. After that, solution were hydrolyzed for 22 hours at 110 °C, wait until it is cool, then poured into 50 ml volumetric flask, added with aquabidest until exact mark. Filtrate then pipetted for 500  $\mu$ l into vial, then added with 40  $\mu$ l AABA and 460  $\mu$ l aquabidest. After samples have been filtered and took for 10  $\mu$ l standard, then added it with 70  $\mu$ l Acc-Q-Flour Borate and vortexed. It was added 20  $\mu$ l flour A reagent and vortexed again, then allowed to stand for 1 minute. Incubation was done for 10 minutes at 55 °C, as soon as it finish then injected to HPLC

### Statistical Analysis

Amino acid content both essential and nonessential in three body size (large, medium, small) of *Anadara indica* at two location were analysed using Anova 1 Factor. The analysis was performed using statistical software.

### Result and Discussion

It is known that bivalve contain high protein beside their cheap price (Srimariana et al. 2014). According to Babu et al. (2012), *Gafrarium tumidum* contained amino acid as much as 42.97%, composed of 20.77 % essential amino acid, and 22.2 % nonessential amino acid.

In this research, 18 amino acids were measured, which were 10 essential amino acids and 8 nonessential amino acids. According Kirk and Othmer (1953) in Nurhayati et al. (2011), when amino acids produced between 18 up to 20 amino acids, it meant that the hydrolysis went well. The content of essential amino acid was shown at Table 1.

According to Table 1, arginin has highest concentration followed by lysin and leucine. Concentration of arginin was high in small *A. indica* at Cibungur (1.86) and large *A.indica* at Garapan (1.47). Histidine has low concentration compared to other amino acids, except for typtophan in small *A. indica* at Cibungur. Totally, high content of essential amino acids were found in small *A. indica* at Cibungur and large *A. indica* at Garapan rivermouth.

Villanueva et al. (2004) reported that arginine was needed for metabolism process in cephalopod, while Pereira et al. (2000) stated that this amino acid was highly found in mollusc muscle. Villanuela et al. (2004) also reported leucine and lycine were highly found in sea molluscs. According to Murdinah (2009), green mussel contain protein 16.7-21.9 %, that were rich in arginine, leucine and lysin. This finding also similar with Chairunisah (2011) and Hidayat (2011).

Table 2 showed the content of nonessential amino acid in *Anadara indica*.

Table 1 Content of essential amino acid in *Anadara indica*

Amino Acid	Garapan			Cibungur		
	Large	Medium	Small	Large	Medium	Small
Histidine	0,41 %	0,34 %	0,27 %	0,33 %	0,34 %	0,42 %
Arginine	1,47 %	1,23 %	1,24 %	1,33 %	1,39 %	1,86 %
Threonine	0,62 %	0,69 %	0,55 %	0,71 %	0,63 %	0,86 %
Valine	0,76 %	0,64 %	0,60 %	0,69 %	0,65 %	0,75 %
Methionine	0,50 %	0,40 %	0,36 %	0,41 %	0,38 %	0,52 %
Lysin	1,16 %	0,98 %	1,16 %	1,34 %	1,30 %	1,38 %
Isoleucine	0,77 %	0,64 %	0,59 %	0,69 %	0,64 %	0,72 %
Leucine	1,24 %	1,04 %	1,06 %	1,07 %	1,05 %	1,30 %
Phenylalanine	0,82 %	0,68 %	0,50 %	0,57 %	0,51 %	0,74 %
Triptophan	0,59 %	0,53 %	0,48 %	0,22 %	0,18 %	0,00 %
Total	8,34 %	7,17 %	6,81 %	7,36 %	7,07 %	8,55 %

Table 2 Content of nonessential amino acid in *Anadara indica*

Amino Acid	Garapan			Cibungur		
	Large	Medium	Small	Large	Medium	Small
Glutamic Acid	1,78 %	1,56 %	2,16 %	2,08 %	2,08 %	2,51 %
Aspartic Acid	1,25 %	1,06 %	1,40 %	1,68 %	1,64 %	1,80 %
Serine	0,71 %	0,51 %	0,64 %	0,59 %	0,64 %	0,88 %
Glycine	0,96 %	0,80 %	0,85 %	1,01 %	1,01 %	1,28 %
Alanine	0,83 %	0,70 %	0,76 %	0,60 %	0,63 %	1,06 %
Proline	1,42 %	0,50 %	0,53 %	0,46 %	0,47 %	0,80 %
Cystine	0,27 %	0,20 %	0,12 %	0,16 %	0,15 %	0,00 %
Tyrosine	0,78 %	0,64 %	0,59 %	0,74 %	0,63 %	0,80 %
Total	8,00 %	5,97 %	7,05 %	7,32 %	7,25 %	9,13 %

Glutamic acid, aspartic acid and glycine have high concentration in *A. indica* (Table 2). The highest content of those amino acids were found in small *A. indica* at Cibungur (2.51, 1.80, 1.28). Cystine has the lower concentration in this cockle (0.00 – 0.27) compared to other nonessential amino acids. Totally, high content of nonessential amino acids were found in small *A. indica* at Cibungur and large *A. indica* at Garapan.

This finding has the same result as Derby et al (2007), who reported that in sea mollusc, glutamic acid, aspartic acid, glycine and alanine were abundant. Krug et al. (2009), stated that in muscle tissue, very high content of nonessential amino acid have been observed. They were alanine, glycine, and glutamic acid.

Based on the result, this cockle were good as source of protein. Murdinah (2009) stated that in condiment (like sauce) made of green mussel contained 15 amino acid. From all of them, there are 4 amino acids that dominant, which were glutamic acid (9,37%), glycine (8,24%), alanine (8,11%), and lysine (8,24%). West and Tood (1964) in Nurhayati (2011), stated that those amino acid together with serine, threonine, cystine and proline give a sweet taste, while glutamic acid as flavour taste.

Result of statistical analysis, showed that there was no significant difference on amino acid content either essential or nonessential between three body size of *Anadara indica* for each location ( $p > 0.05$ ).

Table 3 Statistical analysis

Factor	Garapan		Cibungur	
	Essential AA	Nonessential AA	Essential AA	Nonessential AA
Between Body Size	0.955	0.903	0.912	0.917

## Conclusion

In this research, there are 18 amino acids found in *Anadara indica*. Arginine, leucine, and lysine were essential amino acids that found in *A. indica*. Glutamic acid, aspartic acid and glycine were nonessential amino acids observed in *A. indica*.

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