Crackers from Fresh Water Snail (*Pila ampullacea)* Waste as Alternative Nutritious Food

Crackers from Fresh Water Snail (*Pila ampullacea)* Waste as Alternative Nutritious Food

R T D W Broto[1], F Arifan[1], W A Setyati[2], K Eldiarosa[3] and A R Zein[4]

[1] Department of Industrial Engineering, Faculty of Vocation, Diponegoro University, Prof. Soedarto Street, Indonesia
[2] Faculty of Fisheries and Marine Science Diponegoro University, Prof. Soedarto Street, Indonesia
[3] Department of Chemical Engineering, Diponegoro University, Prof. Soedarto Street 50275, Indonesia
[4] Department of Civil Engineering, Diponegoro University, Prof. Soedarto Street, Indonesia

karintaeldiarosa@gmail.com

Abstract. Fresh water snail (*Pila ampullacea)* is large fresh water snail that can be found in rice fields, ponds, lakes and marshes. Most of them live in paddy fields and become pests for its plant thus the farmer tries to eradicate. Whereas, aquatic animals especially snail contain high level of protein with an amino acid profile similar with the meat land animals, thus making it beneficial to health in countries where snail exists. Thus, fresh water snail can be used as a raw material in producing foods or snacks, one of the famous snack in Southeast Asian countries is cracker. *Pila ampullacea* was obtained from the swamp and was cleaned it up by removed the flesh from its shell and used the water then production of the crackers. Nutrition contents of the fresh water snail cracker is protein (10.67%) and lipid (0.06%). The organoleptic analysis of crispiness was shown good result with mean score is 4.1.

1. Introduction

Fresh water snail (*Pila ampullacea)* is large fresh water snail that can be found in rice fields, ponds, lakes and marshes. The shape of its shell is similar to *Pomacea sp*. with green or black color. Approximate measurements are a height of up to 100 mm and a width of up to 100 mm [1]. This snail belongs to Family Ampullariidae which is similar to the golden apple snail (*Pomacea* canaliculate). *P. ampullacea* prefers several species of aquatic plants, e.g. floating mass (*Salvina cucullata*), swamp morning glory (*Ipomoea aquatica*) and lettuce (*Latuca sativa*). During starvation period, this snail can change feeding preference from aquatic plants to decaying animals [2].

Most of *Pila ampullacea* live in paddy fields and become pests for its plant thus the farmer tries to eradicate them. Whereas, aquatic animals contain high level of protein with an amino acid profile similar with the meat of land animals, making it beneficial to health in countries where there is high consumption of it. Fish and shellfishes have been found to be major sources of protein to both riverine and the general population at large, as they occur abundantly in the brackish and fresh waters [3]. According to the previous research, fresh water snail contains 57.76% of protein, 14.62% of fat,

0.68% carbohydrate, 15.3% of ash and 11.05% of moisture content. Thus, fresh water snail can be used as a raw material in producing foods or snacks. One of the famous snack in Southeast Asian countries is cracker. They are known as *keropok* in Malaysia, *kerupuk* in Indonesia, *kaew krab pla* in Thailand and *banh phong tom* in Vietnam [4]. The aim of this work is to study the nutritional composition of the fresh water snail crackers.

2. Materials and methods

2.1. *Raw material*

Pila ampullacea which was obtained from swamp in Tegowanuh Village, Temanggung, Central Java. Tapioca flour (*Manihot esculentus*) and other ingredients were obtained from a local shop. The flesh of the snail is removed from its shell, then thoroughly washed with water to clean up the sand or other impurities. After getting clean, the flesh was grinded to be smooth for 15 minutes.

2.2. *Production of crackers*

The crackers were formulated by using ratio of fresh water snail to tapioca flour: 1:4. Other ingredients which were used for making this fresh water snail crackers formulation were salt (2%), sugar (1%) and water (20%). The fresh water snail was mixed with half of the flour, sugar and brine then blended them using a high speed cutter mixer in 1 minute. The remaining tapioca flour and brine were added to the blender and blended them in 4 minutes. The mixture was cooked in the water at 90-95^{o}C in 30 minutes. After that, chilled the mixture in room temperature for 30 minutes and sliced it mechanically with 3 mm of thickness by using a meat slicer. Then dried them overnight in an oven at 60^{o}C.

2.3. *Composition and organoleptic analysis*

The macronutrient of the crackers were determined according to the AOAC method in Laboratory of Food Technology Diponegoro University. The protein content was determined by the Kjeldahl method and the lipid content was determined by the Soxhlet method. Organoleptic analysis was determined by the crispiness of the crackers.

3. Results and discussion

Nutritious values of this snail are may affected by age and environment (soil condition and nutrient).

Table 1. Nutritious content of fresh water snail cracker

Nutrition Content	Composition (%)
Protein	10.67
Lipid	0.06

10.67% of the protein content in *P. ampullacea* is lower than other fresh water fishes, however it is still comparable to value obtained in other livestock. Protein which is contained in the fresh water snail is huge organic compound that supports the body cells, regulates the water content, transports the nutrient, takes place on immune process of human body and energy source. Amino acids in the protein of snail could be used to compliment the cereal sources of protein making good their relative deficiency of lysine. According to the previous research, the land snail *Anchanhatina marginata* is a high quality food rich in protein, low in fats and a good source of iron. It is reported that snails have a protein content of 88.42% which compares with animal protein of 82.37% for pork and 92.75% for beef [3].

0.06% of the lipid in this snail is lower compared to other species of animals. In the fresh water snail, fat forms as fatty acid in linoleic acid and linolenic acid known as essential fats [6]. This

substance can be used for treatment of hypertension and other related ailments. Fatty acid in the fresh water snail will decrease cholesterol in the human body. Starch is not a source of fat. The fat that is contained in tapioca flour is only 0.1% [5].

Fresh water snail also consists of vitamins that gives beneficial aspect to the human body. Vitamin A takes role in forming good sense of sight, maintaining the skin health and body immunity. Niacin or Vitamin B3 is essential in carbohydrate metabolism, keeping the glucose in human's blood, convalescence of migraine and vertigo. Vitamin E has a role in maintaining the tissues in the body (skin, eye, erythrocyte and liver). Folate is one of the B-vitamins and is needed to make erythrocyte and leukocytes in the bone marrow, produce DNA and RNA, prevent anemia and convert carbohydrates into energy. Mineral is an important substance to maintain the human body in setting the enzymatic work, neutralizing the acid-alkali in the body, and forming hemoglobin. The minerals on fresh water snail are coper, iron, zinc and manganese [3].

Tabel 2. Mineral content of fresh water snail

Minerals	Composition (mg/100g)
Calcium	129.18
Potassium	71.13
Phosphorus	60.52
Iron	10.90
Sodium	0.04
Magnesium	31.19
Zinc	1.31

As the result of the organoleptic analysis by testing the crispiness of the cracker, mean score of the panelists for the crispiness of the fresh water snail cracker is 4.2 with maximum score is 5. The texture, swelling power and solubility of the crackers are because of the type of the flour. The wet fresh water snail provided available water for starch gelatinization or sufficient protein which when heat denatured was able to resist collapse during the starch expansion [7]. In the cracker products, the starch component gelatinize and expanded on frying process. The degree of the gelatinization of the starch is one of the factors with influences the degree of expansion of half-products when immersed in hot oil [8]. The hardness of fried crackers increased with the decrease in linear expansion, the lower degree of linear expansion is related to the protein of the fresh water snail. Hardness can also be determined by sensory evaluation and usually by using the terms of crispiness with an opposite term for hardness [4]. Beside the crispiness, another characteristics of the cracker is the color. The thickness of the cracker influence to the cracker's color. Thicker product results in a darker color [9].

Figure 1. Fresh water snail crackers which have been produced in Tegowanuh Village, Temanggung, Central Java

4. Conclusion

The results of this study clearly showed that crackers from fresh water snail consist of some nutrition, such as 10.67% of protein, 0.06% of fat, vitamins and minerals. The organoleptic analysis of crispiness was shown good result with mean score is 4.1.

References

[1] Schneider K Meulen R Marwoto and Djojosoebagio S 1996 Current Situation of Edible Snails in Indonesia *Tropicultura* **2** pp 59-63
[2] Lamkom T and Phosri D 2017 Study on Gonadosomatic Index of Thai Native Apple Snail (*Pila ampullacea* Linneaus 1758) in the Rice Fields of Srimuang-mai District Ubon Ratchathani and Effect of Diet on the Growth of Juvelines *Journal of Fisheries and Environment* **41**(1)
[3] Obande R A Omeji S and Isiguzo I 2013 Proximate Composition and Mineral Content of the Fresh Water Snail (*Pila ampullacea*) from River Benue Nigeria *Journal of Environmental Science, Toxiocology and Food Technology* **vol 2**(6) pp 43-46
[4] Nurul H Boni I and Noryati I 2009 The Effect of Different Ratios of Dory Fish to Tapioca Flour on The Linear Expanision Oil Absorption Colour and Hardness of Fish Crackers *International Food Research Journal* **16**(pp) 159-165
[5] Yu S Y 1991 Acceptability of Fish Crakers (Keropok) Made from Different Types of Flour. *ASEAN Food Journal* **6**(3) pp 114-116
[6] Krzynowek J and Murphy J 1987 Proximate Composition Energy Fatty Acid Sodium Cholesterol Conetnt of Finfish Shellfish and their Products National Oceanographic and Atmospheric Administration (NOAA) *Technical Report* US Department of Commerce
[7] Cheow C S Kyaw Z Y Howell N K and Dzulkifly M H 2002 Relationship Between Physicochemical Properties of Starches and Expansion of Fish Cracker 'Keropok' *Journal of Food Quality* **27** pp 1-12
[8] Lachman A 1969 *Snacks and Fried Products* (London: Noyes Data Corporation)
[9] Peranginangin R Fawza Y N Sugiyono and Muljanah I 1997 Food Additives and Effect of Thickness on Fish Crackers Quality *Proceeding of the Seminar on the Advances in Fish Processing Technology in Southeast Asia in Relation to Quality Management* pp 106-114. Singapore