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Nutritional Value of Freshwater Snail *Pila globosa* in Bangladesh

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Abstract: The research is done to ascertain the mineral and proximate content of snail powder of freshwater snails (*Pila globosa*). Many cultures around the world include edible snails in their traditional diets. In addition to being a special treat for gourmets, snail meat provides several nutritional advantages over other meats. It has low fat and calorie content but is rich in inorganic nutrients such as essential amino acids and healthy fatty acids. The samples taken from a nearby beel in the Natore district were cleaned, gutted, dried, and ground to create powder and homogenized samples maintained in plastic containers for chemical testing. The laboratory of the Institute of Environmental Science, University of Rajshahi, Bangladesh, served as the site for all activities. The primary nutritional contents of powder products, including calcium, potassium, sodium, moisture, ash, protein, and lipids, were estimated. Different species chemical makeups were discovered to exist. This samples protein, lipid, moisture, and ash content were 42.88%, 4.70%, 11.98%, and 14.17%, respectively.

Keywords: Bio-Chemical, Food value, Mineral,Nutrition, ***Pila globosa***

INTRODUCTION

Snails are gastropod mollusks that can be found in both water and on land. Of course, not all wild species are edible. The most widely consumed land snails are *Helix pomatia* and *Helix aspersa*. Ampullariidae are freshwater snails, also known as apple snails (*Pila globosa*), eaten in numerous Asian nations. Whelks and abalones, two kinds of marine snails, are also eaten worldwide. Snails have a bland flavor and take on the flavors of the food with they are cooked. They have a firm, slightly chewy texture comparable to squid and mussels. According to consensus, sea snail meat is a good source of vitamin E, phosphorus, potassium, calcium, and salt and has a high carbohydrate, low fat, and high protein content[1], [2]. For about half a kilogram of high-quality animal feed, a kilogram of enormous snails for human consumption may be retrieved[3]. Snails are consumed in significant quantities in several European countries, especially France because they are low in cholesterol and fat and high in minerals and proteins[4]. Snails used to be directly harvested from the wild during the rainy season rather than being raised on farms for direct consumption or sale[5]–[7].The toxicological and microbiological risk to human health has been identified in numerous studies and products containing snail flesh[8]. Before using snails as food, it is essential to comprehend the species and gathering techniques.

Many researchers work on the physiochemical analysis of various species of snails. Zymantiene*et al*., 2006 work on Selected Features of Vineyard Snails Shells, their Movement, and the Physico-Chemical Composition of Foot Meat. Budiari *et al*., 2021 work on the Effect of *Pomaceacanaliculata* snail feed on physical carcass composition meat chemical composition, and hematological profile of muscovy duck. Danilova *et al*., 2022 work on the Determination of the Nutritional Properties of Snail Meat and Its Comparative

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Analysis with Other Animal Species. Ezeama, 2005 works on the Microbiological and Chemical Characteristics of Meat and Shucking Liquid Wastes of Freshwater Snails (*Pila ovata*). Primary study on Nutritional Value and Physico-Chemical Characteristics of Apple Snail *Pila globosa* (Swainson) and *LymnaealuteolaLamark* worked by Nargis*et al*.,2011 In Bangladesh.

By contrasting them with flesh from various animals, several researchers have examined the nutritional qualities of other species of snails. However, *Pila globosa* meat nutritional makeup has not been detailed study and not to compared with other animals meat nutrition. Since most people in Bangladesh rely on fish to meet their nutritional needs, our research's primary focus is determining how much snails may contribute as a nutrient-rich meal.

2. MATERIALS AND METHODS

Samples were collected from the local beel of Natore district of Rajshahi division, Bangladesh. The collected samples were brought into the laboratory of Institute of Environmental Science, University of Rajshahi.

Figure 1: Sample collected area

2.1. Processing of Samples

Collected snail samples were washed in potable water to eliminate grit and other surface material. In order to prevent microbiological contamination, the shell was removed and cleansed adequately under running water. The samples were dried for 75 hours at 70 degrees in an air dryer oven before ground into powder using a household blender. Moisture, protein, ash, and lipids were estimated according to AOAC (1975).

2.2. Estimation of Proximate Composition

According to accepted procedures, the approximate composition of snail powder (including its protein, fat, moisture, ash, and carbohydrate content) was ascertained. The protein of products made from snail powder was assessed using the Micro-Kjeldahl distillation method. The lipid content of powder products was ascertained using the soxhlet apparatus after petroleum ether extraction. While the ash content was calculated using the following approach, the moisture content was evaluated using a moisture analyzer (MAC 50/NH). The approach was used to compute the percentage of carbohydrates.

2.3. Estimation of Minerals

The mineral content of powder items, including sodium, calcium, and potassium, was assessed using the accepted techniques. APHA used atomic absorption spectrometers to detect the sodium and potassium concentration (ELICO, SL 194 Model). A flame method was used to measure calcium.

3. RESULT AND DISCUSSION

The g/100g biochemical composition of *P. globosa* is assessed, including ash, moisture, lipids, and carbohydrates. Figure 2displayed the nutritional values derived from proximate compositional analysis of dried snail powder, which comprises moisture, protein, lipid, ash, and carbohydrate.

3.1. Protein content

Our protein analysis of snail meat (on a dry weight basis) found a protein content of 42.88%

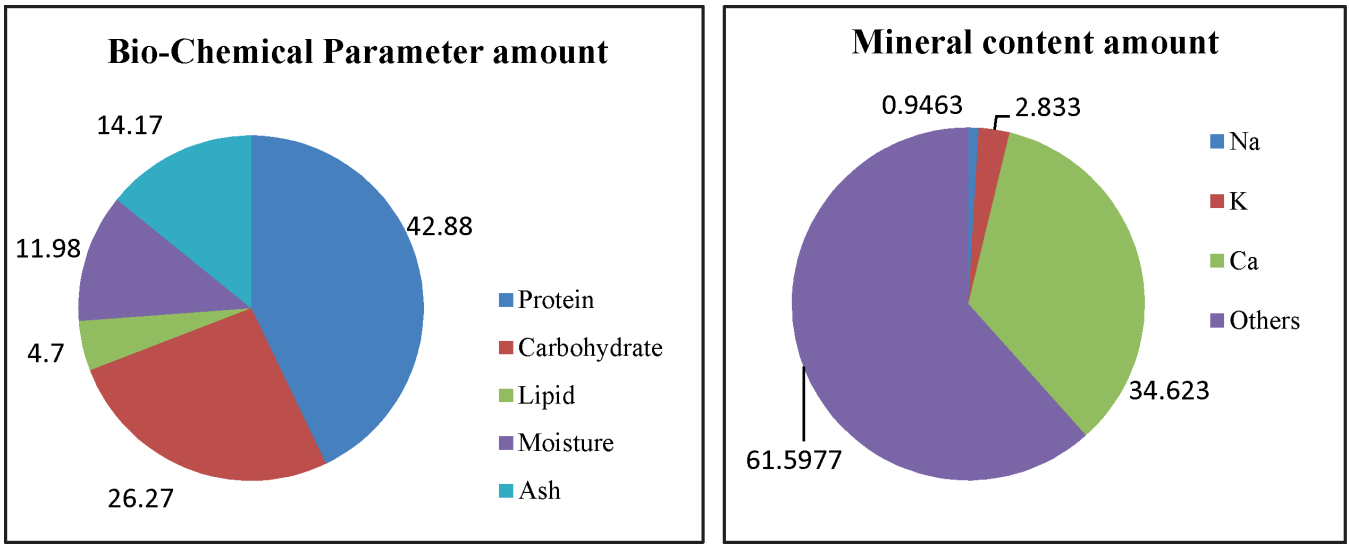

Figure 2: Nutritional composition of P.globosameatpowder

(Figure 2). In one research[9], 33.81% protein was found in dry snail meat, which is lower than the present study. Snails have a similar amount of protein to fish and meat; however, they have significantly less fat than those animals. Snails are a vital source of iron, calcium, vitamin A, and several other minerals and have high protein and low-fat content. According to Haque, 2004 typically, sun-dried fish contains 60 to 80% protein. Beef, goat, and sheep meats' respective crude protein percentages were 19.00%, 15.05%, and 18.06%. [10].Figure 3 contrasts the snailsprotein content with the meat from various animals, as stated below.The body requires protein to build new cells and repair damaged ones. Protein is required for the body to function correctly. Protein can be found in every part of the human body. The muscles, tissues, skin, hair, and bones come after the organs.

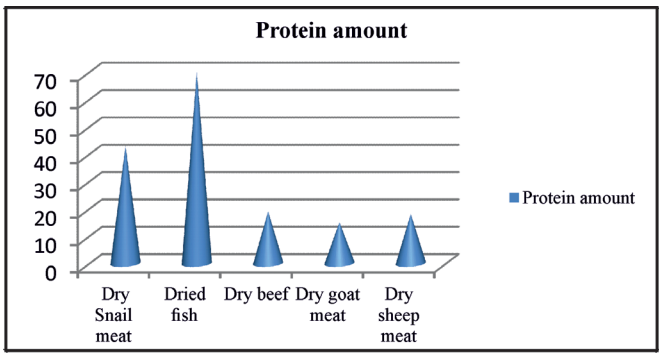

Figure 3: Column diagram showing the protein compositions of different animals

3.2. Carbohydrate

26.27% carbohydrate was found in our carbohydrate analysis (Figure: 2). Beef, goat, and sheep dry meats respective carbohydrate percentages were -0.50%, 0.36%, -0.27% [10]. Figure 4 contrasts the snails' carbohydrate content with the following meat from various animals. Carbohydrates are essential in the human body. They provide energy, aid in controlling blood glucose and insulin metabolism, participate in the metabolism of cholesterol and triglycerides, and aid in fermentation. Fish is exceptionally high in B12, iodine, and omega-3 fatty acids, all of which are deficient in many people. Almost all types of fish and seafood, like meat, have almost no carbs. However, different fish contain 3-5% carbohydrates, depending on the species.

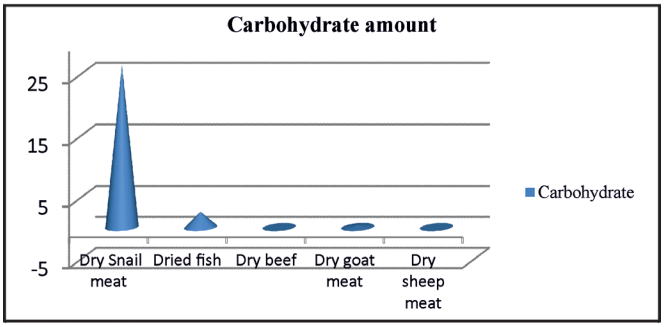

Figure 4: Column diagram showing the carbohydrate compositions of different animals

3.3. Lipid

Lipids, the primary organic reserve and source of metabolic energy are critical for cellular

integrity; in the present study, the lipid content recorded in dry snail meat was 4.70% (Figure:2). In a study[9], it was reported that the lipid content of dry snail meat was 1.80% which is lower than the present study. Lipids are water-insoluble macro-biomolecules soluble in organic solvents and serve various biological functions ranging from fuel molecules to energy stores to membrane components[11]. For cow, goat, and sheep meat, lipid content in dry base the percentage of lipid (fat) was 19.67%, 17.00%, and 22.00%, respectively [10]. Typically, sun-dried fish contains 3.7-17.8% lipid [12].Snailslipid content is compared to that of various animal meats in Figure 5, which is presented below.

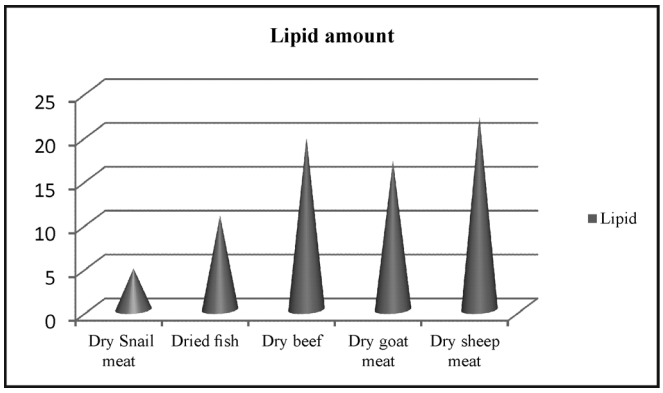

Figure 5: Column diagram showing the lipid compositions of different animals

3.4. Moisture

All living systems moisture contributes equally to the essential properties of life. As a result, it is an important body component of fish. While fresh fish retains high water content, drying removes the water from the flesh. It reduces water activity, making the water inaccessible to microorganisms and extending the shelf life of dried products [13]. In different parts of Bangladesh, the moisture content of freshwater-dried fish ranged from 10.2% to 35.50%. The moisture content of marine dried fish ranged from 11.27% to 39.59% [14]. In the present study, Moisture content was recorded in dry snail meat at 11.98% (Figure: 2). One study [9]obtained 75.31% moisture in dry snail meat, which is higher than our present study. The moisture content in the dry base was 2.26%, 2.86%, and 2.00% for cow meat goat meat, and sheep meat, respectively [10]. Figure 6 compares the moisture composition of snails with meat from several animals, as mentioned below.

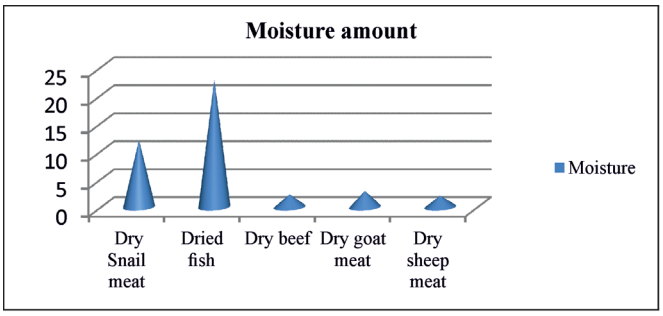

Figure 6: Column diagram showing the moisture compositions of different animals

3.5. Ash

The inorganic residue (minerals) left after ignition, and complete oxidation of organic matter is represented by ash content. Snails eat a variety of food sources, including soil, which could explain the relatively high ash value obtained in this study. This work yielded a 14.17% ash value (Figure: 2).In a study[9]it was reported that the ash contentof *P. globosa*was 1.31% which is lower than the presentstudy. For cow meat, goat meat, and sheep meat, the ash content in the dry base was 9.50%, 5.17%, and 16.00%[10].Figure 7 shows a comparison of the Ash content of snails with meat from various animals.Traditional sun-dried products have higher ash content than conventional dried products. Traditional dried fish contained 9.45% ash. However, in conventional dried fish, these values were 8.29% [15].

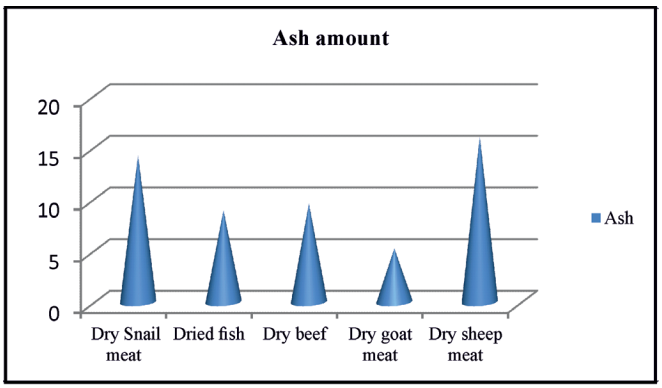

Figure 7: Column diagram showing the ash compositions of different animals

3.6. Mineral composition in dried snail meat and their health benefits

Snails are high-nutritional-value meat that is consumed all over the world. They have anti-cancer and immune-boosting properties due

to their anti-inflammatory and antioxidant properties. Mineral ratios are frequently more critical in determining nutritional deficiencies and excesses; they can predict future or hidden metabolic dysfunctions [16].Mineral content varies according to location, species, and pre-treatments of raw materials with salt and herbal substance during drying [17].Small fish and their dried products are a good source of minerals[18]. 37.623% calcium content was found in the mineral test of dried snail meat of *P.globosa*. Calcium is required for bone formation, muscle tone, and nervous impulses in the human body [19]. It also aids in the formation of blood clots, muscle contraction, and osmoregulation. Furthermore, calcium serves as an enzymatic cofactor [20]. Because of the high calcium requirement during infancy and childhood, when the skeleton is actively growing, the incorporation of powdered snail meat into foods intended for weaning infants is also highly recommended[21]. 2.833% of potassium content was found in our present study. Potassium promotes normal nerve, muscle, and heart function, sugar metabolism, acid-base balance, and brain oxygenation. Excess potassium loss from the body, such as in diabetes and diarrhea, or loss in the urine following diuretic drugs used to treat hypertension, can also result in severe potassium depletion[22]. In our study, 0.9463% Na was found (Figure 2). According to the Harvard T.H. Chan School of Public Health, a small amount of sodium is required by the human body to conduct nerve impulses, contract and relax muscles, and maintain proper water and mineral balance. It is estimated that we require approximately 500 mg of sodium per day for these vital functions. However, consuming too much sodium can result in high blood pressure, heart disease, and stroke.

4. CONCLUSION

According to the findings of this study, snail meat is equally nutritious in almost every aspect and even more nutritious than any other animal meat in terms of protein percentage. Dry snail meat powder has high protein and low lipid content and a high supply of calcium, which is essential for human life. Regarding nutritional security, powdered snail meat may be an essential source of protein and minerals. Policymakers and food and nutrition experts must work together to promote the nutritional value of dried snail meat and encourage particularly vulnerable populations (children and pregnant and lactating women) to include dry fish in their diet.

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