

Original Research Article

DETERMINATION OF THE NUTRITIVE VALUES OF *Pelophylax esculentus*

(EDIBLE FROG) FOUND IN HANYAN GWARI, MINNA NIGER STATE, NIGERIA

ABSTRACT

The proximate, selected minerals, amino acid profile, functional properties and anti-nutrient composition of edible frog (*Pelophylax esculentus*) were determined using standard analytical methods of analysis. The crude protein was $31.17 \pm 1.36\%$, carbohydrate was found to be $29.02 \pm 1.16\%$ while the crude fibre was $11.71 \pm 0.22\%$. The crude fat was $16.22 \pm 0.16\%$, ash content was $8.93 \pm 1.33\%$ and moisture was $3.49 \pm 0.56\%$. The abundance of mineral elements found in the meat of *P. esculentus* was found to be in the order: sodium > phosphorus > potassium > calcium > zinc > magnesium > copper > iron > manganese. The calorific value was 506.17 kcal/100g while the animal was also found to have reasonable amounts of essential amino acids: tryptophan (0.39), lysine (7.62), arginine (6.13), histidine (2.13), threonine (3.94), valine (4.82), methionine (2.89), leucine (7.22), isoleucine (3.83) and phytylalanine (4.14). Based on its anti-nutritional contents of *P. esculentus* meat could be considered as a good source of animal protein for man and his animals. From the result obtained *P. esculentus* could be a good low cost and easy source of animal protein, good of calcium, reasonable amount of potassium as well as sodium.

Keywords: edible frog, functional properties, proximate analysis, amino acid profile

INTRODUCTION

Meat is important to human beings and could be obtained from various sources. It is very good source of nutrients and vitamins to the body. Due to its high cost and some health problems associated with red meat, research is now focused on other means of meat that would be cheaper and safer for consumption especially the aquatic animals [1]. Since meats contain essential classes of food such as, carbohydrate, proteins, fat, vitamins and minerals, they provide the nutritional requirement of man in the appropriate quantities [2]. The provision of these nutritional entities becomes a major problem in most developing countries such as Nigeria leading to under- or malnutrition. In a view to reduce this under- or malnutrition in Nigeria some lesser known animals which can serve as food are examined for their nutritive and non-nutritive values for human consumption. One class of such known animals that could be considered for this purpose is the amphibian [3].

Pelophylax esculentus (edible frog), formally known as *Rana esculentus* is considered to be of good nutritional value [4]. It is a widespread natural hybrid that is produced as an offspring of the parent species *P. lessonae* and *P. ridibundus* [5]. This frog is the fertile hybrid of the Pool

Frog (*Pelophylax lessonae*) and the Marsh Frog (*Pelophylax ridibundus*). It belongs to the kingdom: animalia, phylum: chordate, class: amphibian, order: anuran, family: ranida, genus: pelophylax and species: p.lessonae + p.ridibundu [5]. The aim of this study is to determine the proximate, minerals, functional properties, anti-nutritional factors and amino acid profile of *Pelophylax esculentus* in order to establish the safety or otherwise of the consumption of this amphibian by humans.

3.0 MATERIAL AND METHOD

The sample (*pelophylax esculentus*) used in the course of this work were obtained from Hanya Gwari bosso around F. U. T environment in Minna, Niger State.

3.4 Sample preparation and treatment

The samples were cut opened and sun dried for proper removal of moisture. They were then ground into fine powder using porcelain mortar and pestle, sieved to pass a 40 mm mesh sieve and stored in air tight containers prior to the commencement of the analysis.

3.5 METHOD

3.5.1 Proximate Analysis

The standard analytical procedures for food analysis were adopted for the determination of moisture content, crude protein, crude fibre, percentage lipids, carbohydrate, acid insoluble ash and energy value as outlined by AOAC [6].

Minerals analysis

Sodium and potassium were determined using Gallenkamp Flame analyzer, while calcium, magnesium, iron, manganese, zinc and copper were determined using Buch Model 205 Atomic Absorption Spectrophotometer. Phosphorus level was determined using the phosphovanado molybdate colorimetric techniques on JENWAY 6100 Spectrophotometer [7].

Amino acid contents

50 g of ground seed sample was defatted with chloroform and methanol mixture in a ratio 1:1, then, 30 g of the defatted sample was put into a glass ampoule, 7 ml of 6 M HCl was added and oxygen expelled by passing nitrogen into the ampoule was put in the oven at 105°C for 22 h, allowed cool and filtered. The filtrate was then evaporated to dryness at 40°C under vacuum in a rotary evaporator. The residue was dissolved with 5ml acetate buffer (pH 2.0) and loaded into the amino acid composition and the seed samples were determined by ion exchange

chromatography (IEC) method using the Technicon Sequential Multi-sample Amino acid Analyzer (Technicon Instruments Corporation, New York) [8].

Functional Properties

The standard analytical procedures for food analysis were used for the determination of bulk density, gelation capacity, water/oil absorption capacity, wettability, gelatinization temperature, viscosity and pH determination was carried out using the method of AOAC [6] while foam capacity and stability was **determining** using the method as described by Abbey and Ibeh [9]. The emulsification capacity was also determined by the method of Padmashree *et al.*, [10].

Phytochemical constituents

Phytochemical analysis was carried out according to method as described by Krishnaiah *et al.*, [11].

4.0 RESULTS AND DISCUSSION

Table 1: The selected mineral contents of the edible frog (*Pelophylax esculentus*)

| Parameter | Content |
|------------|-----------------|
| Iron | 35.93±3.67 |
| Zinc | 219.45±15.71 |
| Copper | 54.55±12.86 |
| Sodium | 2,550.00±212.1 |
| Calcium | 477.50±35.36 |
| Potassium | 679.00±41.01 |
| Phosphorus | 1,220.54±141.57 |
| Manganese | 2.75±0.35 |
| Magnesium | 87.56±0.04 |

Values are means of triplicate determination ± standard deviation

Table 2: Some anti-nutritional factors of the edible frog (*Pelophylax esculentus*)

| Parameter | Content |
|-------------|-----------|
| Saponin (%) | 1.75±0.35 |

| | |
|---------------|-----------|
| Tannin (%) | 5.37±0.53 |
| Flavonoid (%) | 1.75±0.35 |
| Alkaloid (%) | 2.80±0.00 |
| Oxalate (%) | 2.78±0.00 |

80 Values are means of triplicate determination ± standard deviation

Table 3: Functional properties of the edible frog (*Pelophylax esculentus*)

| Parameter | Content |
|--------------------------------------|------------|
| Bulk density (g/cm ³) | 0.60±0.01 |
| Oil absorption capacity (%) | 2.01±0.23 |
| Water absorption capacity (%) | 4.55±0.11 |
| Foaming stability (cm ³) | 56.70±0.00 |
| Emulsification capacity (%) | 50.08±1.96 |
| Gelation capacity (%) | 2.00±0.41 |
| Gelatinization temperature(°c) | 69.00±0.71 |
| Wettability (s) | 60.04±0.66 |
| Viscosity (s) | 23.27±1.66 |
| pH | 8.60±0.00 |

81 Values are means of triplicate determination ± standard deviation

Table 4: Proximate composition of the edible frog (*Pelophylax esculentus*)

| Parameter | Percentage |
|------------------|------------|
| Moisture content | 3.49±0.56 |
| Ash content | 8.93±1.33 |
| Crude fat | 16.22±0.16 |

| | |
|-----------------------------|------------|
| Crude fibre | 11.71±0.22 |
| Crude protein | 31.17±1.36 |
| Carbohydrate | 29.02±1.16 |
| Calorific value (kcal/100g) | 506.17 |

82 Values are means of triplicate determination ± standard deviation

Table 5: Result of amino acids contents in edible frog (*Pelophylax esculentus*)

| Parameter | Concentration in g/100g |
|----------------|-------------------------|
| *Lysine | 7.62 |
| *Histidine | 2.13 |
| *Arginine | 6.13 |
| Asparti acid | 9.16 |
| *Threosine | 3.94 |
| Serine | 4.24 |
| Glutamic acid | 13.86 |
| Proline | 4.04 |
| Glycine | 7.24 |
| Alanine | 5.60 |
| Cysteine | 0.93 |
| *Valine | 4.82 |
| *Methionine | 2.89 |
| *Isoleucine | 3.83 |
| *Leucine | 7.22 |
| Tyrosine | 3.06 |
| *Phenylalanine | 4.14 |
| *Tryptophan | 0.93 |
| EAA (%) | 47.60 |
| NEAA(%) | 52.40 |

* = essential amino acid, EAA = essential amino acid, NEAA = non-essential amino acid.

4.1 DISCUSSION OF RESULT

The nutritional value of a given food depends on the nutrient and anti-nutritional constituents of the food [12]. Table 1 shows that the presence of the selected mineral elements in the sample was in order: sodium > phosphorus > potassium > calcium > zinc > magnesium > copper > iron > manganese. The calculated ratio of Na/K in the body is of great importance in the control of high blood pressure. Na/K ratio of less than one is recommended, [13]. Hence *Pelophylax esculentus* meat may not be a good protein source for a diabetic since it had a Na/K ratio of 3.76. McDonald [14] reported that calcium in conjunction with magnesium, phosphorus, manganese, vitamin A, C and D, chlorine and protein is involved in bone formation. From the results obtained *Pelophylax esculentus* will serve as a good source of minerals involved in bone formation since it contains large amounts of calcium and considerable amounts of magnesium but little amount of manganese. Ozkan, [15] considered a food source to be good if its Ca/P ratio is above one and poor if the ratio is less than 0.5. The Ca/P ratio of *Pelophylax esculentus* was 0.39 and based on this, the meat may have to be augmented with a higher calcium source in order to meet up the calcium requirement of the body.

Tannins and oxalate affect the bioavailability of composite nutrients, complexing with bivalent ions Ca^{2+} , Mg^{2+} , Fe^{2+} and Zn^{2+} . This makes them unavailable especially in monogastric animals [16]. From Table 2, all the anti-nutrient contents of *Pelophylax esculentus* were very low compared with the values reported for other meat sources [17].

From Table 4 it indicates that, the meat of *Pelophylax esculentus* contains lower moisture value (3.39%) which means that it have a good shelf value Adeyeye, [19]. The ash content of this sample was slightly high (8.71%) and this was expected because the sample was prepared by crushing both the meat and bones together. The carbohydrate value of 29.02% showed that *Pelophylax esculentus*, being an animal, is not a good source of carbohydrate. The crude fat value in the meat was much 16.22%, since crude fat is important part of diet, which decreases serum cholesterol levels risk of coronary heart disease, hypertension, diabetes and breast cancer [20]. The crude fibre contents of the meat was 11.71%, which meant that *Pelophylax esculentus* could not be a rich source of crude fibre because since this value fell short of the respective ranges of 19-25%, 21-30% and 29% required for children, adult, pregnant and lactating mothers as reported by Ishida *et al.*, [20]. The crude protein of *Pelophylax esculentus* was 31.17% which could be used to qualify it as a good source of low cost animal protein.

The result of essential and non essential amino acid profile of the study animal (*Pelophylax esculentus*) 5. The result showed that the non-essential amino acids content had higher percentage with 52.40% while essential amino acid contents amount to 47.60%. Similar amino acid compositions was recorded for *Hoplobat rachus occipitalis* reported by Onadeko *et al.*, [3]. The

percentage present in both essential and non-essential amino acid were there to complement each other when present in food; though they were desire in a certain quantity.

4.2 CONCLUSION

From the results obtained in this study, it shows that the meat of *Pelophylax esculentus* have higher nutrient composition and calorie value .It also indicate high content of mineral elements composition given the Na/K ratio is above 1 which may not be too good for a diabetic patient. *Pelophylax esculentus* also showed higher nutritional values compared to some meat most especially in terms of crude protein, this will make them a good source of animal protein. They could also serve as a good source for and required for healthy bones. However, *Pelophylax esculentus* is animal it may not have high carbohydrates content.

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