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E-mail: bjsir07@gmail.com

Nutritional Value and Physico-Chemical Characteristics of Apple Snail *Pila globosa* (Swainson) and *Lymnaea luteola* Lamark

A. Nargis*, D. Talukder, S. H. A, Pramanik and M. R Hasan

BCSIR Laboratories, Binodpur Bazar, Rajshahi-6206, Bangladesh

Abstract

The physico-chemical characteristics, lipids, protein, fat, moisture and ash of *P. globosa* and *L.luteola* were studied. The percentage of oil content found were 2.30 ± 0.29 and 1.61 ± 0.12 in meat of *P. globosa* and *L. luteola.* The protein and fat content of *P. globosa* were 33.81% and 1.80% whereas 22.71% and 1.49% in *L. luteola.* The moisture content were 75.31% and 78.96% in *P. globosa* and *L. luteola* respectively. The total lipid extracts were fractionated into three major lipid groups neutral lipids, glycolipids and phospholipids by silicic acid column chromatography. The glycolipid were averaged to 57.39% and 57.24% of the weight of the lipid applied in *L. luteola* and *P. globosa.* The percentage composition of fatty acids were found in the form of oleic 19.46 ± 0.33, lauric 13.23 ± 0.73, palmitic 16.56 ± 0.41 in *L. luteola* and 20.37 ±1.38, 14.30 ± 1.06 and 18.52 ± 1.10 in *P. globosa* respectively.

Keywords: *P. globosa, L .luteola*, Lipid , Protein, Moisture.

Introduction

Snails are the largest groups of mollusks constituting the largest animal group after arthropods (Yoloye,1984). The highly portentous and delicious molluscan meat is on an increasing demand throughout the world. The *P. globosa* are edible to aboriginal people and particularly they have been used as medicines for the cure of a number of ailment such as rheumatism, cardiac diseases, controlling blood pressure, asthma, rickets, calcium metabolism, nervousness, giddiness and also providing missing vitamins and minerals (Mahata, 2002). *L. luteola* also an important freshwater mollusks from the viewpoint of medicinal science and a source of animal protein. Most tribal people of Bangladesh consume the flesh of snail. Saha (1998) mentioned that 29 groups of tribal people of Bangladesh consume the flesh of *P. globosa.* Elmislie (1982) reported that snail trade is an important component of International World Trade. There has been considerable interest in snail farming in Italy and France in recent years, just as its consumption has greatly increased over few years (Elmislie 1982). Of prime importance to man is the curative medicinal ability of snail meat to alleviate, asthma, utrricaria and circulatory disorders (Oyenuga 1968). It can moreover surprises high body temperature, constipation and hemorrhoids. It restores virility, vitality and can successfully cure hypertension (Oyenuga 1968). According to Ning zhu *et. al*. (1968) mollusks as a group have a unique sterol and fatty acid composition. Many workers (Misra *et.al* 2002, Mahata 2002 and Prabhakar and Roy 2009) worked on the distribution of fatty acids and fatty aldehydes of total lipids of *P. globosa* from India were studied .

In Bangladesh, there is a gap in current knowledge of the lipid composition of snails which belong to the phylum Molluska. The present work had therefore, been undertaken with a view to carry on a complete chemical investigation of the oil as regards to its characterization and lipids composition.

Materials and Methods

P. globosa and *L. luteola* were collected from culturing tank of snail present in BCSIR Campus, Rajshahi during May 2009 to July 2009. The snails were collected in fresh condition. Immediately after collection, the snails were washed and shell diameter and weight were taken. The shells were carefully removed so that the edible parts could be removed and semidried in an electric oven at 60^{o}C. Then these are blended in an electric blender. The oil of semidried samples was extracted with n-Hexene in a Soxhlet Apparatus for 8 hours. n-Hexane as extracted solvent has been selected because this solvent has better effect over other polar solvents like alcohol, ketone, aldehyde, ethers, ester etc (Horn

*Corresponding author. E-mail:

et. al., 1982). The solvent removed by usually a rotary vacuum evaporator and the percentage of oil content was calculated. The specified gravity of the oil calculated at 28°C by standard IUPAC methods. Moisture in the oil was also determined by IUPAC method. The free fatty acid (FFA), saponification value and unsaponification matters in the oil were determined by the standard AOCS methods (1980). Hanus method was followed to determine the iodine value of the oil (AOAC, 1955). The crude oil was pooled and stored in a glass vials at 15°C and lipid analysis was conducted after extract extraction as soon as possible.

Fractionation of lipid by column chromatography

Three major lipid classes of crude oil were fractionated by silicic acid, (E. Merck, Darmastad, Germany, 70- 230 mash) column chromatography (Rouser and Kritchevsky, 1967). The silicic acid was washed with water and methanol to remove fines and impurities. It was activated at 120°C overnight and again for 1 hour immediately before the colum was prepared. A slurry of 25g of silicic acid in chloroform was poured in to the column (2.2 cm i.d.), 150mg of total lipids were dissolved in 5ml eluting solvent and quantitatively transferred to the column. Nutral lipids were eluted with 200ml of methanol. The elution was controlled at a flow rate of 0.5 ml - 1.0ml/min. The complete elution of each fraction was monitored by micro slide TLC during silicic acid column chromatography and the eluted solvents were collected in a weighed flask. The fractions thus obtained were evaporated in a rotary vacuum evaporator and dried under reduced pressure before being weighed. The percentages of these fractions were determined by gravimetric method.

Results and Discussion

The physico-chemical characteristics of the extracted oils were determined by the conventional methods and the results were shown in Table I. The results (Table I) indicated that the oil from the *P. globosa* differed from *L. luteola* in having a higher refractive index (1.21), iodine value (50.28), unsaponification matter (1.55%) and saponification value 194.63). The percentage of oil in *L. luteola* is 1.61 ± 0.12 and 2.30 ± 0.29 in *P. globosa.* No remarkable changes of FFA in both the snail.

Table II shows fatty acids (FA) of both the snails. FA as oleic in *P. globosa* is (20.37%) whereas in *L. luteola* (19.46%). FA as lauric and pamitic in *P. globosa* are 14.30% and 18.52% which is lower in *L. leuteola* (13.23%) and (16.65%) respectively.

Table II: Fatty Acid (FA) of *L. luteola* and *P. globosa.*

	L. luteola Mean±SD	*P. globosa.* Mean±SD
FA as oleic %	19.46±0.33	20.37±1.38
FA as lauric %	13.23±0.73	14.30±1.06
FA as palmitic %	16.65±0.41	18.52±1.10

Mean value of three experimental results.

Total extracted snail meat lipids were separated into neutral lipids, glycolipids and phospholipids by silicic acid column and the results were depicted in Table III. The results indicated that no significant change in the lipid composition among the two sample was noticed. However, it was remarkable to note that the percentages of phospholipids were found to be lower in *P. globosa* than neutral and glycolipid in comparison with *L. luteola.* The glycolipid was averaged to 57.39% and 57.24% of the weight of the lipid applied in *L. luteola* and *P. globosa.*

The percentage of protein, fat, moisture and ash of both the snails were depicted in Table IV. The percentage of protein in *P. globosa* is high i. e. 33.81% whereas in *L. luteola* is 22.71%. The fat content in both the snails are same. In *P. globsa*

Table I: Physico-chemical characteristics of *L. luteola* and *P. globosa*

Serial No	Physico-chemical characteristics	*L. luteola* Mean±SD	*Pila globosa* Mean±SD
1.	Percentage of oil	1.61±0.12	2.30±0.29
2.	Specific gravity at 28 °C	0.76±0.02	0.89± 0.003
3.	Refractive index at 28°C	1.17±0.01	1.21 ±0.01
4.	Iodine value	49.78±3.09	50.28± 1.56
5.	Saponification value	171.3 ±8.84	194.63± 1.42
6.	Unsaponification matter	1.29±0.14	1.55±0.02
7.	Melting point (° C)	30-31°C± 0.00	30-31°C± 0.00
8.	FFA	1.72 ±0.025	1.73± 0.036

Mean value of three experimental results.

Table III: Lipid composition of *L. luteola* and *P. globosa*

	L. luteola Mean±SD	*P. globosa.* Mean±SD
Neutral lipid %	21.32±0.38	22.61±0.73
Glycolipid %	56.61±0.83	56.65±0.53
Phospholipid %	19.71±0.35	18.71±0.20

Mean value of three experimental results.

is 1.80% and in *L. luteola* is 1.49%. The percentage of moisture in *L. luteola* and *P. globosa* are 78.96% and 75.31% respectively. The results shows that both the snails were high protein but low in fat which is similar to Milinsk *et. al.,* 2006.

Table: IV: Protein, fat, moisture and ash of *L. luteola* and *P. globosa*

	L. luteola Mean±SD	*P. globosa.* Mean±SD
Protein %	17.86±0.85	21.47±1.27
Fat %	1.49±0.06	1.80±0.05
Moisture %	78.96±0.24	75.31±1.50
Ash %	1.29±0.04	1.31±0.05

Mean value of three experimental results.

Özogul *et. al.* (2005) worked on proximate analysis of *Helix pomatia* from Turkey and found that they are rich in protein (18%) and low in lipid (0.49%). He also found that the predominant fatty acids were palmitic (16:0), estearic (18:0), oleic (18:1 n-9) and linoleic (18:2 n-6). The physico-chemical properties of meat oils are directly related to their lipids and glyceride composition (Misra *et. al.,* 2002). The nutritive value of snail meat has reported that snail is high in protein but low in fat contents. It is estimated that snail is 15% protein, 2.4% fat and about 80% water. This makes snail healthy alternative food for people with high protein, low fat diet requirements (Su *et. al.,* 2004 and Orisawuy, 1989).

Conclusion

The results of this work revealed that snail meat is a protein source with low lipid content that has with essential fatty acids in its composition. Thus, we can say that this food can be used for patient nutrition irrespective of total lipid content (Saldanha, 2001). Omevbore (1988) has assessed the nutritive value of Archachativa marginata in relation of some popular conventional animal protein sources and discovered that snail meat has a protein content of 88.37%, a value which compare favorably with conventional animal protein sources whose value range from 82.42% (Pork) to 92.75% (beef).

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