A Study on Nutrient and Elemental Analysis of Fish Samples from Fishery Pond (Shar-Khae-Gyi-In), Kyonpyaw Township, Ayeyarwady Region

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Abstract

Fish samples Nga-baht (*Wallago attu*), Nga-myit-chin (*Labeo rohita*) and Nga-yant (*Channa striata*) were collected from Shar Khae Gyi In, Kyonpyaw Township, Ayeyarwady Region. The nutritional values of the three different fish samples were determined by AOAC (Horwitz, 2000) methods. The moisture contents were found to be 6.06% in Nga-baht, 8.46% in Nga-myit-chin and 14.73% in Nga-yant respectively. Ash contents were found to be 6.11% in Nga-baht, 4.12% in Nga-myit-chin and 5.13% in Nga-yant respectively. Protein contents were found to be 85.15% in Nga-baht, 73.55% in Nga-myit-chin and 76.17% in Nga-yant respectively. Crude fiber contents were found to be 0.10% in Nga-baht, 0.06% in Nga-myit-chin and 0.12% in Nga-yant respectively. Crude fat contents were found to be 1.18% in Nga-baht, 12.09% in Nga-myit-chin and 2.70% in Nga-yant respectively. Carbohydrate contents were found to be 1.40% in Nga-baht, 1.72% in Nga-myit-chin and1.15% in Nga-yant respectively. Energy values of fish samples were found to be 353 kcal/ 100g in Nga-baht, 412 kcal/100g in Nga-myit-chin and 335 kcal/100g in Nga-yant respectively. The elements Fe, Cu, Zn, Ca and Pb content of the three different fish samples were analyzed by Atomic Absorption Spectrophotometer. The iron contents were found to be 14 ppm in Nga-baht, 12 ppm in Nga-myit-chin and 17 ppm in Nga-yant respectively. Zinc contents were found to be 12 ppm in Nga-baht, 10 ppm in Nga-myit-chin and 12 ppm in Nga-yant respectively. Calcium contents were found to be 326 ppm in Nga-baht, 465 ppm in Nga-myit-chin and 1652 ppm in Nga-yant respectively. Copper contents were found to be 2 ppm in each fish samples but lead was not detected. The iron and calcium contents of Nga-yant (*Channa striata*) were higher than the two other fish samples. Calcium content of Nga-yant (*Channa striata*) was higher than the two other fish samples.

Keywords: Nga-baht, Nga-myit-chin, Nga-yant, Shar Khae Gyi In, Nutritional values, AOAC methods, Atomic Absorption Spectrophotometer

Introduction

Fish is very important part of a healthy diet. For many people living in developing countries, especially those living near coastal and inland waters, fish are dominant animal source food (Peter, 1993). Fish and other seafood are the major sources of healthful long-chain omega-3 fat and are also rich in other nutrient such as vitamin D and selenium, high in protein, and low in saturated fat. Globally more than two billion people are estimating to be deficient in essential vitamins and minerals, especially vitamin A, iron and zinc. Micronutrient deficiency during pregnancy and early childhood can severely affect health and development (Bader, 2008). When available and affordable, the consumption of animal source foods can alleviate nutritional deficiencies and are key component in a balanced and nutritious diet. Most people can get enough by consuming fatty fish at least twice a week (Akoto et. al., 2012).

The pollution of the aquatic environment with heavy metals has become a worldwide problem during recent years, because they are indestructible and most of then toxic effect on organism. Among the environment pollutants, metals are particular concerned, due to their potential toxic effect and ability to bioaccumulate in aquatic ecosystem (Lapedes, 1974). The contamination of fresh water with a wide range of pollutant has become a matter concern over the last few decades (Paehlke, 1995). The natural aquatic systems may extensively of

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concern over the last few decades. The natural aquatic systems may extensively be contaminated with heavy metals released from domestic, industrial and other man-made activities. Among animal species, fishes are the inhabitants that cannot escape from the detrimental effort of these pollutants (Mirelky & Saraleguy, 2004; Rash, 2001).

Zoological Description of *Wallago attu*

Phylum	:	Chordata
Class	:	Teleostomi
Order	:	Siluriformes
Family	:	Siluridae
Genus	:	*Wallago* (1801)
Species	:	*Wallago attu*
Local name	:	Nga-baht

Zoological Description of *Labeo rohita*

Phylum	:	Chordata
Class	:	Actinopterygii
Order	:	Cypriniformes
Family	:	Cyprinidae
Genus	:	*Labeo* (1817)
Species	:	*Labeo rohita*
Local name	:	Nga-myit-chin

Zoological Description of *Channa straiata*

Phylum	:	Chordata
Class	:	Actinopterygii
Order	:	Periformes
Family	:	Channidae
Genus	:	*Channa* (1794)
Species	:	*Channa striata*
Local name	:	Nga-yant

Iron

Iron plays much chemical reaction in the body. Iron-deficiency anemia can be treated with iron supplements, and by adopting strategies to improve the body absorption of the iron supplement (eg. Taking iron with vitamin C, which enhance absorption, but not milk, which limit absorption) (Hoppe et. al., 2005).

Lead

Lead is poisonous to animals and humans, damaging the nervous system and causing brain disorder. Excessive lead also causes blood disorders is mammals. The symptoms of lead poisoning may include anemia, constipation, difficulty sleeping, headache, irritability, reduced sensation. Lead can cause kidney damage, reduced IQ, hearing problem and slowed body growth (Helfman & Collectle, 2009).

Zinc

Zinc is a trace element that is essential for human health. Zinc is found in cells throughout the body (Allen, 1998). Foods that are a great source of zinc include learn red meat like beef, lamb and liver and seafood such as oysters and lobster. Whole grains, seeds, beans, nuts and almonds are all good sources. High protein food contain high amount of zinc.

Calcium

Calcium is essential for living organisms, in particular in cell physiology. Some people use calcium for complication after intestinal bypass surgery, high blood pressure, to reduce high fluoride levels in children and to reduce high lead levels. Calcium is also found in the blood and muscle. Calcium is an important component of a healthy diet and a mineral necessary for life.

Copper

Copper is a essential trace element in plants and animals, but not some micro-organisms. Copper is bound in the gut, and then transported to the lover bound to albumin (Rickett and Payer, 1995). Copper is used for food preparation, hospitals, coins, plumbing system. The liver is regular the amount of copper in blood which is used as medicine. Copper is used for improving wound healing, and brittle bone. Its deficiency can be caused by diet. The body uses copper for proper bone, nervous system, joint and circularly system health. Copper compounds are used as bacteriostatic substances, fungicides and wood preservatives. Copper is a essential to all living organisms as a truce dietary mineral because it is a key constituent of the respiratory enzyme system (Rickett & Payer, 1995).

Materials and Methods

Sample Collection

The three species of fish samples were collected from Shar Khae Gyi In, Kyonpyaw Township, Ayeyarwady Region. Shar Khae Gyi In is located in Kyonpyaw Township, Ayeryarwady Region (Figure - 1). It has a distance of 15 kilometer from Kyonpyaw. Shar Khae Gyi In lies between 17^{o} 22´ N to 17^{o} 43´ N and 95^{o} 19´ E to 95^{o} 21´ E (Figure - 2). It lies besides Hinthada- Pathein Highway Road. It has many fish species, it is well known for freshwater fishery. The fish samples are Nga-baht (*Wallago attu*), Nga-myit-chin (*Labeo rohita*) and Nga-yant (*Channa striata*) (Figure - 3, i, ii and iii). The fish samples were collected at the period of September, 2014.

Sample Preparation

The flesh of the fish samples were scrapped off using a steel spoon. The collected flesh was dried in an oven and the dried course sample was stored in a polythene bag.

The nutritional values of collected fish samples were determined by the following methods (Table 1).

Table (1) Methods for the Determination of Nutritional Values of Collected Fish Samples

Analyte	Analysis Method
Moisture Content	Oven Dry Method
Ash Content	Ashing Method
Protein Content	Macro-Kjeldahl Method
Crude Fiber Content	Chemical Analysis Method
Crude Fat Content	Chemical Analysis Method
Carbohydrate Content	A.O.A.C Method
Energy Value	A.O.A.C Method

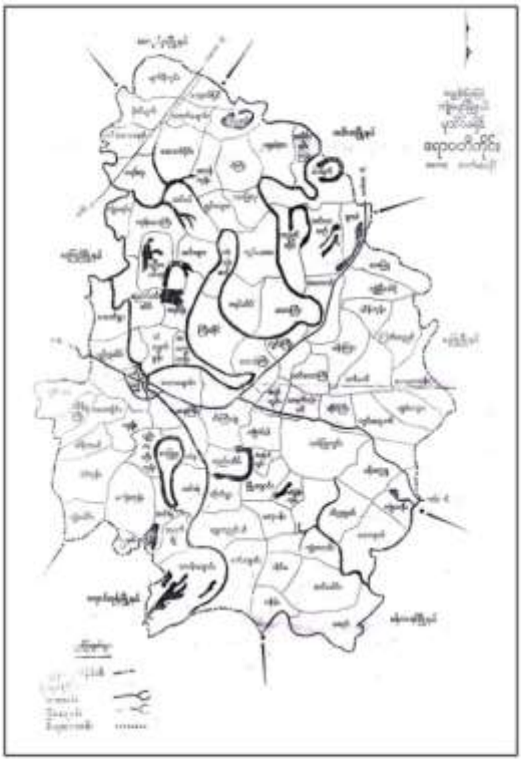

Figure (1) Location map of Shar-Khae-Gyi-In Kyonpyaw Township

Figure (2) Google map of Shar-Khae-Gyi-In Kyonpyaw Township

(i) (ii) (iii)

Figure (3) Collected fish samples, (i) Nga-baht (*Wallago attu*), (ii) Nga-myit-chin (*Labeo rohita*), (iii) Nga-yant (*Channa striata*)

Determination of Heavy Metals Content of Fish Samples by AAS Method

Sample

Fish samples

Instrument

Atomic Absorption Spectrophotometer

AA- 6300 (Shimadzu, Japan)

Procedure

The collected fish samples were determined by Atomic Absorption Spectrophotometer. AAS model is AA-6300 spectrophotometer (Shimadzu). Specific hollow cathode lamp was used. The concentrations were recorded from the digital read out.

Results and Discussion

There are many fishery ponds in Ayeyarwady Region. Shar Khae Gyi In was chosen in this research work. Three different species of fish samples; Nga-baht (*Wallago attu*), Nga-myit-chin (*Labeo rohita*), and Nga-yant (*Channa striata*) were studied in this research work. The nutritional values and heavy metal contents of the three different species of fish samples were determined by modern instrumental techniques.

Nutritional Values and Heave Metals content of Fish Samples

The nutritional values and heave metals content of collected fish samples were determined by AOAC methods and AAS method. The results are presented in Table (2) and (3). The moisture content of fish samples is based on the dried sample.

Table (2) Nutritional values of collected fish samples

Nutrition Analysis Test	Nga-baht (*Wallago attu*)	Nga-myit-chin (*Labeo rohita*)	Nga-yant (*Channa striata*)
Moisture (%)	6.06	8.46	14.73
Ash Content (%)	6.11	4.12	5.13
Protein Content (%)	85.15	73.55	76.17
Crude Fiber Content (%)	0.10	0.06	0.12
Crude Fat Content (%)	1.18	12.09	2.70
Carbohydrate Content (%)	1.40	1.72	1.15
Energy Value (Kcal/ 100g)	353	412	335

Table (3) Heavy metal contents of collected fish samples by AAS Method

Heavy Metal	Nga-baht (*Wallago attu*)	Nga-myit-chin (*Labeo rohita*)	Nga-yant (*Channa striata*)
Iron (Fe) Content (ppm)	14	12	17
Lead (Pb) Content (ppm)	ND	ND	ND
Zinc (Zc) Content (ppm)	12	10	12
Calcium (Ca) Content (ppm)	326	465	1652
Copper (Cu) Content (ppm)	2	2	2

ND = Not Detected

Conclusion

The results of this study indicate low levels of exposure to the toxic and essential elements Pb, Fe, Cu, Zn and Ca through consumption of the three different fish species of Nga-baht *(Wallago attu)*, Nga-myit-chin *(Labeo rohita)* and Nga-yant *(Channa striata)*. The levels of the elements do not pose a significant risk to the individuals and to a greater extent the general population that consumes these fish species.

It was found that the moisture contents of fish samples were found to be 6.06% (Nga-baht), 8.46% (Nga-myit-chin) and 14.75% (Nga-yant) respectively. Ash contents were found to be 6.11% (Nga-baht), 4.12% (Nga-myit-chin) and 5.13% (Nga-yant) respectively. Protein contents were found to be 85.15% (Nga-baht), 75.55% (Nga-myint-chin) and 76.17% (Nga-yant) respectively. So, Nga-baht is the most suitable to get large amount of protein. Crude fiber contents were found to be 0.10% (Nga-baht), 0.6% (Nga-myit-chin) and 0.12% (Nga-yant) respectively. So, Nga-yant is the most suitable to get large amount of crude fiber. Crude fat contents were found to be 1.18% (Nga-baht), 12.09% (Nga-myit-chin) and 2.70% (Nga-yant) respectively. So, Nga-myit-chin is the most suitable to get large amount of crude fat. Carbohydrate contents were found to be 1.40% (Nga-baht), 1.72% (Nga-myit-chin) and 1.15% (Nga-yant) respectively. So, Nga-myit-chin is the most suitable to get large amount of carbohydrate. Energy values were found to be 353 kcal/100g (Nga-baht), 412 kcal/100g (Nga-myit-chin) and 335 kcal/100g (Nga-yant) respectively.

The elements Fe, Cu, Zn, Ca and Pb contents of three different fish samples were analyzed by Atomic Absorption Spectrophotometer.The iron contents of fish samples were found to be 14 ppm (Nga-baht), 12 ppm (Nag-myit-chin) and 17 ppm (Nga-yant) respectively. The zinc contents of fish samples were found to be 12 ppm (Nga-baht), 10 ppm (Nga-myit-chin) and 12 ppm (Nga-yant) respectively. The calcium contents of fish samples were found to be 326 ppm (Nga-baht), 465 ppm (Nga-myit-chin) and 1652 ppm (Nga-yant) respectively. The copper contents of fish samples were found to be 2 ppm for each fish sample. The concentrations of lead in three different fish samples were not detected. The iron and calcium contents of Nga-yant *(Channa striata)* were higher than the two other Nga-baht *(Wallgo attu)* and Nga-myit-chin *(Labeo rohita)*.It was concluded that the fish species Nga-baht (*Wallago attu*), Nga-myit-chin (*Labeo rohita*) and Nga-yant (*Channa striata*) from Shar Khae Gyi In are suitable for consumption.

Acknowledgement

We would like to express our profound thank to Dr. Aung Win, Acting-Rector of Hinthada University and Dr. Theingi Shwe, Pro-Rector of Hinthada University, for their kind permission to carry of this research. Special thanks are also due to Dr. Theingi Nyo, Professor and Head of Chemistry Department, Hinthada University, for her encouragement, guidance and criticism to this research.

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