

Studies on the Nutritional Values of *Wallago attu* from Ayeyarwady River

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Abstract

The Ayeyarwady river is the life-blood of Myanmar people and fresh water aquatic organisms. So, in this research work, one of the well-known commercial fishes, Nga-but (*Wallago attu*) was collected for chemical analysis. The sample was collected from Mayangyan Jetty, Ayeyarwady river, Mandalay. The amount of protein present in the sample was measured by micro Kjeldahl's method. The protein content of flesh sample was found to be 20.06% - 20.50%. Ash content of sample was determined by oven drying method. The ash content of flesh, bone, internal organs were found to be 0.86%, 3.49%, 1.25% and 1.12% respectively. Water content of sample was determined by Dean and Stark distillation method. The water content of flesh sample was found to be 54.77%-55.55%. Mineral compositions (K, P, Ca, Fe, As, Cd, Hg, Pb, etc) in sample were analyzed by using Spectro XEPOS EDXRF spectrometa, Germany. The potassium, phosphorus, Calcium, Iron, Arsenic, Mercury and Lead contents of flesh sample were found to be 23.27%,13.82%, 1.11%, 0.88%, 0.00004%, not detected, 0.00026% and 0.00011% respectively.

Key words : Fish, Kjeldahl's method, distillation method, Spectro XEPOS EDXRF spectrometa, Germany

Introduction

Wallago attu (Nga-but) is a kind of very well-known fish in Myanmar traditional foods. It is widely distributed throughout the rivers of Myanmar. Fish is a very important dietary animal protein source for the people. Fishes are source of good quality protein and contain minerals which are vital to our health. Protein is one of the important macro components of living systems. Fishes having high protein content give shiny appearance to our face and body, which is a sign of good health. Fish content vitamin B-6 and B-12, helps in producing red blood cells, antibodies and maintain the central nervous system. Minerals are required for normal life processes and all animals including fish need these inorganic elements. Fish offers a good source of calcium which is needed for the body for the formation of healthy bones and teeth. Minerals are responsible for skeletal formation, maintenance of colloidal systems and for biologically important compounds such as hormones and enzymes. Vitamins and mineral are essential to the body because organism could not survive long without any of them. Therefore, *Wallago attu* was chosen to analyse its flesh, bone, skin and internal organs in this research work.

Aim and Objectives

Aim

The aim of the present work is to analyse the nutritional values of *Wallago attu*.

Objectives

- to collect *Wallago attu* sample from Ayeyarwady River, Mandalay
- to examine the physicochemical properties of *Wallago attu*
- to analyse the essential element present of *Wallago attu*
- to detect the water content of *Wallago attu*
- to determine the nitrogen and protein content of *Wallago attu*

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Zoological Description



Fig.1. The Sample of *Wallago attu*

Family	: Siluridae
Genus	: <i>Wallago</i>
Species	: <i>W. attu</i>
Scientific name	: <i>Wallago attu</i>
Common name	: Boal
Myanmar name	: Nga-but
Part used	: Flesh, bone, skin and internal organs

Wallago attu is sometimes called freshwater shark because they feed small fishes, shrimps, insects and mollusks. *Wallago attu* fish's body is elongated, laterally compressed. Abdomen's rounded. Head is larger, depressed. Snout is spatulated, somewhat protruded. Eyes are small. Mouth wide, its gape extends posteriorly to beyond eyes. Two pairs of barbels, maxillary pair is long. Dorsal fin short. Pectoral spine weak. Caudal fin deeply forked. Body colour is grayish or yellowish grey in above and whitish in below but the fins grey. Lips are thin. Jaws are sub equal, lower jaw is longer and prominent.

Geographical Distribution

Myanmar, India, Bangladesh, Java, Kampuchea, Malay, Peninsula, Srilanka, Sumatra, Thailand, Vietnam.

Materials and Methods

Sample Collection

The *Wallago attu* samples were collected from Ayeyarwady River in Mandalay. The samples were washed with tap water to remove the dirt and other contaminants on the skin.



Fig.2. Flesh, Bone, Skin and Internal organs of (*Wallago attu*) Nga - but from Ayeyarwady River.

Determination of Ash Content of *Wallago attu*

Firstly, flesh, bone, skin, and internal organs of the *Wallago attu* were cut into small pieces, about 3g of each sample were accurately weighed and put in a preheated, cooled and weighed porcelain crucible. They were heated on the hot plate to be charred. Then, they were placed in the muffle furnace at 600°C until the residue was uniformly changed red-brown to white. Finally, it was cooled in the desiccator and weighed. The processing of heating, cooling and weighing was repeated until the constant weight was obtained.

$$\text{Ash \%} = \frac{\text{Wt of residue (g)}}{\text{Wt of sample (g)}} \times 100$$

Determination of Protein Contents by using Kjeldahl's Method

Accurately weighed (1 g) of defatted sample powder was placed in the Kjeldahl digestion tube. Kjeldahl catalyst, anhydrous copper sulphate (8 g), pure sulphuric acid (15 mL) and some pieces of pumic stone were added to the Kjeldahl's digestion tube. Then it was shaken until the contents were well mixed. The digestion tube with the sample was placed into the Bloc-digest with the fume removed operating. The digestion was done at a temperature 150 °C for 15 min, 300 °C for 15 min and 400 °C for 1 hour. At the end of the process, the green colour liquid was obtained. It was allowed to cool and transferred into the conical flask. Distilled water (100 mL) was carefully added into the flask with frequent shaking. The Kjeldahl's distillation apparatus was set up, taking care that the tip of the condenser extended well below the surface of standard sulphuric acid solution (30 mL) in the receiver. The digested solution was poured into the distillation flask and then 40 % sodium hydroxide solution (100 mL) was added into it through the dropping funnel to make the mixture strongly alkaline. The evolved ammonia was distilled off and passed into a receiver containing sulphuric acid and the distillate with suspect to excess sulphuric acid was titrated with standard sodium hydroxide solution using methyl orange as an indicator. A blank determination was carried out exactly as above, but instead of sample powder, distilled water (5 mL) was used.

Calculation

$$\text{Protein \%} = \frac{0.014 \times 100 \times (X - V) M_B}{W} \times 6.25$$

Where,

- X = Volume (mL) of NaOH solution used in blank
- V = Volume (mL) of NaOH solution used in test
- M_B = Concentration of NaOH solution
- W = Weight (g) of sample



Fig.3. Digestion of Protein Content



Fig.4. Distillation of Protein Content

Determination of Water Content of Flesh Sample by Dean and Stark Apparatus

About 5g of flesh sample was subjected to reflux distillation apparatus using 50mL toluene as solvent. The volume of water collected in the graduated collecting tube gave the water content of the sample.



Fig.5. Dean and Stark Apparatus

Determination of Mineral Contents of *Wallago attu* by EDXRF

Mineral contents and heavy toxic metals in *Wallago attu* were determined qualitatively and quantitatively by using EDXRF spectrometers at Department of Physics, University of Mandalay.



Fig.6. Spectro XEPOS EDXRF Spectrometers, Germany

Results and Discussion

Determination of Physicochemical Properties of *Wallago attu*

The physical and chemical properties of *Nga-but* in flesh, bone, skin and internal organs were determined and the results were described in tables.

Table(1) The ash contents of flesh, bone, skin and internal organs of *Wallago attu*

Samples	Ash contents (%)		
	1 st	2 st	3 st
flesh	0.93	0.86	0.86
bone	3.56	3.49	3.49
skin	1.35	1.25	1.25
Internal organs	1.20	1.12	1.12

According to Table (1), the ash content of flesh, bone, skin and internal organs of *Wallago attu* were found to be 0.86% - 0.93%, 3.49% - 3.56%, 1.25% - 1.35% and 1.12% - 1.20% respectively.

Table (2) Determination of water content of flesh of *Wallago attu*

No.	Water content(%)
1	55.55
2	54.77
3	54.77

According to this table, the water content of flesh of *Wallago attu* was found to be 54.77% - 55.55%.

Table (3) Determination of nitrogen and proteins contents of Flesh of *Wallago attu* by using Kjeldahl's Methods

No.	Nitrogen(%)	Protein(%)
1	3.21	20.06
2	3.28	20.50
3	3.28	20.50

According to this table, the amount of nitrogen content of flesh was found to be 3.21% - 3.28% and protein content of flesh was found to be 20.06% - 20.50% *Wallago attu* is nutrient rich. Protein is essential to human health and also can be used to provide energy.

Table (4) Determination of elements of *Wallago attu* by EDXRF Analysis

No.	Elements	Flesh(%)	Bone(%)	Skin(%)	Internal organs(%)
1.	Potassium(K)	23.2700	3.3520	12.9400	9.5790
2.	Phosphorous(P)	13.8200	15.6400	13.9300	13.0200
3.	Chlorine(Cl)	3.7010	3.0920	7.6020	6.2230
4.	Aluminium(Al)	1.6310	1.7570	1.6050	1.6870
5.	Calcium(Ca)	1.1080	26.6400	12.9000	13.3700
6.	Iron(Fe)	0.8758	0.2245	0.4220	3.8460
7.	Sulfur(S)	0.2588	0.0926	0.1028	0.2784
8.	Zinc(Zn)	0.0311	0.0310	0.1482	0.1583
9.	Rubidium(Rb)	0.0213	0.0015	0.0138	0.0113
10.	Copper(Cu)	0.0200	0.0027	0.0078	0.0382
11.	Maganese(Mn)	0.0175	0.0081	0.0101	0.0316
12.	Titanium(Ti)	0.0146	0.0101	0.0086	0.0327
13.	Bromine(Br)	0.0108	0.0054	0.0128	0.0729

According to that table, the highest amount of potassium was found in flesh and skin sample. The largest amount of calcium was found in bone and internal organs. Flesh, bone, skin and internal organs of *Wallago attu* contain large amount of phosphorous. The highest amount of chlorine was found only in skin sample. These minerals are essential dietary constituents for human life.

Table (5) Determination of Heavy Toxic Metal of *Wallago attu* by EDXRF Analysis

No.	Elements	Flesh(%)	Bone(%)	Skin(%)	Internal organ(%)
1.	Arsenic	0.00004	0.00012	0.00007	0.00052
2.	Cadmium	ND	ND	ND	0.00008
3.	Mercury	0.00026	0.00030	0.00031	0.00026
4.	Lead	0.00011	0.00086	0.00106	0.00297

From this table, the amount of arsenic in skin sample was found to be twice amount of flesh sample. The amount of mercury of all samples was not too much different from each other. The amount of lead in skin sample was found to be ten times that of flesh sample. Therefore, skin should be removed for eating. Internal organs should be avoided for eating. The largest amounts of arsenic and lead were found in internal organs.

Conclusion

Wallago attu (Nga-but) samples were collected from Ayeyarwady river, Mandalay Region. The nutritional values of *Wallago attu* were determined. The ash content of *Wallago attu* bone was the highest and that of flesh was the lowest. The water content of flesh of *Wallago attu* was found to be 54.77 % - 55.55 %. The amount of nitrogen of flesh of *Wallago attu* was 3.21%- 3.28%. The protein content of flesh of *Wallago attu* was found to be 20.06% - 20.50 %. The trace elements and heavy toxic metals present in flesh, bone, skin and internal organs were analyzed qualitatively and quantitatively by EDXRF, spectrometer. The highest amount of potassium was found in flesh and skin sample. The largest amount of calcium was found in bone and internal organs. Flesh, bone, skin and internal organs of *Wallago attu* contain a large amount of phosphorous. The highest amount of chlorine was found only in skin sample. The aluminum amount of sample was found to be nearly the same. Cadmium, heavy toxic metal was found to be not detected in the flesh, bone and skin sample of *Wallago attu*. The highest amount of mercury was found only in skin sample. The amount of arsenic in skin sample was found to be twice amount of flesh sample. The amount of mercury of all samples were not too much different from each other. The amount of lead in skin sample was found to be ten times that of flesh sample. Therefore, skin should be removed for eating. Internal organ also should be avoided for eating. The largest amount of arsenic and lead were found in internal organs. In the flesh of *Wallago attu*, protein content was found to be 20.06%-20.50% and heavy toxic metals such as As and Pb were found to be little. Therefore, *Wallago attu* should be suitable to eat for human body building. Moreover, eating fishes protect diseases such as heart attack, diabetes, hypertension and paralysis.

Acknowledgements

I would like to express my gratitude to Dr Aye Kyaw, Rector of Yadanabon University, Dr Khin Ma Ma Tin and Dr Myinzu Min, the Pro-rectors of Yadanabon University, for providing necessary resources. I owe a great deal of gratitude to Professor Dr Hlaing Hlaing Myat, Head of Department of Chemistry, Yadanabon University for her invaluable advice, guidance and encouragement throughout this research.

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