International Journal of

Zoological Research

ISSN 1811-9778

Academic Journals Inc.

www.academicjournals.com

International Journal of Zoological Research 2 (2): 110-115, 2006
ISSN 1811-9778

Nutritive Evaluation of Edible Trash Fish: II Use of Trash Protein in Cereal Food Diet

[1]Rukhsana Talat and [2]Rafia Azmat
[1]Department of Zoology, [2]Department of Chemistry,
Jinnah University for Women, Karachi, Pakistan

Abstract: The essential and non essential amino acid has been estimated to determine the quality of protein of ediable fishes from trash fish collected from Karachi fish harbor. The crude protein was analyzed by standard method. The amino acid contents from protein hydrolyze were analyzed by high speed amino acid analyzer model 835. The results were discussed in order to evaluate the protein value of the ediable species present in trash and its utilization as a food of poultry, supplement of cereal food because of nutritional point of view, man cannot survive on a bread diet alone. It was suggested that the variations in values of protein contents of edible fishes of trash may be due to difference in species, size, age, physiological state, time and region of catch.

Key words: Protein, trash fishes, amino acid and cereal

Introduction

As food, fishes are highly nutritious. They are particularly valuable for providing proteins of high quality compare to meat, milk or eggs. This has been shown by biological experiments as well as by amino acid analysis (Ghu, 1992). Fishes are also a good supplement of cereal food because form nutritioual point of view man cannot survive on bread diet alone; more over all cereal grains are low in protein quantity and quality (Scrimshow and Bressani, 1960). They are particularly low in lysine and methionine which are essential amino-acids while the fish protein is relatively rich in these amino acids and it also contain all the other essential amino acids which are required for a balanced diet (Haris, 1964). Pakistan has large fishery resources but they are not fully exploited. In Pakistan malnutrition and protein deficiencies are prevalent and by proper civilization of our protein resource we can solve our problems of malnutrition.

So many scientists worked on the nutritive value of ediable fishes Bransted (1963) estimate the amino acid composition of fresh fish and influence of storage and processing. Ekern *et al.* (1962) studies the fish and fishery products in ruminant nutrion. Mesck (1962) described the importance of fisheries production and utilization in the food economy fish in nutrition. The biochemical and nutritional studies on East Pakistan fish part V. influence of age of fish on the distribution of protein in their body; part Vii chemical composition and quality of the traditioually processes fish (Qudrat -i- Khuda and Khan, 1962; Qudrat -i- Khuda *et al.*, 1962). Stansby (1962) observe the proximate composition of fish. Brody (Yousif and Hindik, 1965) worked on fishery by-products. Haq *et al.* (1974) studied the fish hydrolyzates and fish extracts form teleostean fishes of the Arabian sea. Gras *et al.* (1978) estimated free amino acids and ninhydrin positive. substance in fish 1. Muscle and skin of rainbow trout (*Salmo gaitdneric*).

Corresponding Author: Rukhsana Talat, Department of Zoology, Jinnah University for Women, Karachi, Pakistan

Medford and Mackey (1978) studied the protein and lipid content of gonads liver and muscle of northern Pike (Esoxlucius) in relative to gonade growth. Nakagawa and Kayama (1978) have done the biochemical studies on crap plasma protein 2. Amino acid composition of an albumin. Afolobi and Oke (1981) studied the seasonal variability of nutritive values of fish blue whiting (Micromesistius poutassou). lvor (1997) have studied the option for utilization of bycatch and discard from marine. Lall (2000) estimated the rate of nutrition in fish health. Jacobsen and Hansin (2000) studied the feeding habit of atlantic salmon. Nwanna (2003) estemated the nutritive value and digestibility of fermented shrimp head waste meal by Africal cat fish *Calrias gariepinus*. Hung *et al*. (2004) made the comparison of dietary protein and energy utilization in three Asian cat fishes (*Panagasius bocouti, P. hypothalmus and P. djambal).*

So it is important to point out that for the proper use of trash it is desirable to conduct studies on its biochemical composition and nutritive value. Keeping in view this objective the present research work was to estimate the crude protein and further analyzed into their component i.e., essential amino acid from the protein hydrolysate. Trash fish has great economic importance, it is widely used in many developed and under developed countries for industrial purposes mainly for the production of several different by products, such as fish protein concentrate, fish fertilizer and fish meal. Fish protein concentrate is one of the most important by-product which could be an important food item of the future human diet. It is very rich in protein essential mineral and vitamins. The fish fertilizer increases the quantity of crops. The present study was undertaken to evaluate the food value of edible fishes which are caught as trash on our coast. By proper utilization of protein resources we can solve our problems of malnutrition.

Materials and Methods

The crude protein of twenty three edible species form trash were determined by microkjeldahl distillation method (Hawk *et al*., 1954). In the pre-treatment for protein hydrolyzed analsysis by the reagents like HCl, NaOH and NH_4OH were used of A.R. grade (Merck and BDH) and amino acid contents form protein hydrolyzate were analyzed on high speed amino acid analyzer model 835.

Results and Discussion

A marked variation has been found in protein content of these fishes. It ranged from 42.18 to 65.62%. Among the twenty-three species studies, half of them have protein percentage 40 to 50%.

C. malbaricus (44.06), *A. dispar* (43.75) *J. axillaries* (43.7), *G. setifer* (42.18), *R. sarba* (42.96), *C. indicus* (45.62), *L. brevirostris* (46.87), *Pomasays* sp. (48.43), *G. microlepis* (46.87), *C. dorab* (49.53), *L. strongylocephalus* (48.43). In six species it varied form 50 to 60% *C. sexfaciatus* (59.375), *J.sina* (55.4), *A. latus* (52.34), *C. forskalii* (58.59), *I. Filigra* (52.65) and *N. nasus* (55.46), while in the rest five species more than 60% protein have been found, *O. argenteus* (64.06), *P. filamentosa* (62.5), *L. lactarius* (65.62), *E. hamiltoni* (61.25) and *S. acutipinnis* (61.25) (Table 1).

These results showed that in all these fishes a good quantity of protein is present just like the commercial fishes so they can be safely used in food to supplement protein. The variation in crude protein content have been reported by Qudrat-i-Khuda *et al*. (1962), Stansby (1962) and Haq *et al*. (1974) reported the protein of some commercial fishes and trash, they estimated protein value by four different methods i.e by proteolytic the method (78.65%), by alkaline extraction method (79.81%), by aqueous extraction method (84.432%) and by drying method (42.10%). (The variation may be due to difference in species, age, time and region of catch).

Table 1: Crude protein of edible fishes of trash (expressed as mg g^{-1} of dry wt.)

Name of Species	Crude protein
Carnx sexfaciatus	59.375±1.1
C. malbaricus	44.060±1.00
Johnius axillaries	43.070±0.00
J. Sina	55.400±0.1
Otolithus argenteus	64.060±0.3
Pertica filamentosa	62.500±0.4
Gerreomorpha setifer	42.180±0.1
Acanthopagrus latus	52.340±0.3
Rhabdoscargus sarba	42.960±0.4
Crenideus indicus	45.620±0.2
Crenideus forskalii	58.590±0.3
Therapon jarbua	51.500±0.4
Leiognathus brevirostris	46.870±0.1
Pomadasyas sp.	48.430±0.1
Lactarius lactarius	65.620±0.2
Gobius microlepis	46.870±0.3
Engarulis hamiltonii	61.200±1.2
Llisha filigra	52.650±1.3
Nematolosa nasus	55.460±1.4
Chirocentrus dorab	49.530±1.3
Liza strongy locephalus	48.430±1.1
Sphyraena acntipinns	61.250±1.2
Aphanius dispar	43.750±1.1

All amino acids which are shown in Table 2 are detected in *T. jarbua, L. brevirostris, Pomadasys* sp., *L. lactaris*, *C. dorab*, *L. strongylocephalus*, *S. acutipinnis* and *A. disper*. In *J. axillaries* sp. arginine was not detected, in *J. sina* and *O. argenteus* sp. histidine in not detected. In *C. forskalii* sp. three amino acid, isoleucine, leucine and arginine were not detected. In *C. malbaricus* sp. methionene tyrosine, histidne and arginine are absent. In *C. sexfaciatus* sp. the absence of proline, methionine, tyrosine, phenylalanine, histidine and arginine are noted. In *P. filamentosa* threonine, alanine, valine, isoleucine, histidine and agrinine were not found. In *A. latus* sp. the absence of glutamic acid, proline, methionine, isoleucine, tyrosine, phenylalanine, histidine and arginine were noted. In *R. sarba* sp. only five amino acids were detected, aspartic acid, serince gultamic acid, glycine and lysine. Only in one species *C. indicus* not a single amino acid detected, this may be due to complete spoilage.

Present results indicated that some of the species show low quantity of amino acid. It is due to spoilage of fishes because there is improper handling of trash fish resulting in the absence of some essential amino acid. Due to spoilage the amino acid content decompose into NH_3. Those fishes which were not spoiled before procuring have all the essential amino acid and we can place them in high grade protein fishes. If fisherman would have handled and carried the trash fishes properly then all the fishes must have shown a high rate protein and we can use these edible fishes as good sources of protein.

The length of sample fishes (fresh) with their commercial size (Munro, 1955 and Qureshi, 1955) is in Table 3. This comparison showed that all these species of trash were caught and have not attained their normal size fishes. It is a great economic loss to the nation because if these would have been spared form catching, they would have attained marketable size within a small period of time and have been used as human food. In the form to trash avoid these fishes get spoiled due to mishandling and loose their nutritive values.

Table 2: Amino acid composition (protein hydrolyzate) of edible fishes of trash (expressed in mg g^{-1} of dry wt.)

Amino acid	*C. sexfaciatus* 10^2	*C. malbaricus*	*J. axillaries*	*J. sina*	*O. argenteus*	*P. filamentosa*	*G. setifer*	*A. Ltus* 10^2
Asp.	5.40±0.02	0.257±0.01	0.145±0.01	1.381±0.001	0.329±0.001	0.072±0.004	1.929±0.01	3.1±0.002
Thre.	1.40±0.01	0.106±0.02	0.153±0.001	0.668±0.001	0.108±0.002	-	1.213±0.001	1.2±0.02
Ser.	3.89±0.003	0.094±0.03	0.107±0.002	0.717±0.001	0.185±0.001	0.038±0.004	1.262±0.001	5.5±0.03
Glu.	1.25±0.003	0.309±0.04	0.297±0.003	2.838±0.001	0.684±0.003	0.203±0.004	3.329±0.002	-
Pro.	-	0.06±0.02	0.072±0.003	0.049±0.001	0.129±0.003	0.058±0.003	0.691±0.004	-
Gly.	4.01±0.01	0.133±0.03	0.442±0.001	1.121±0.003	0.165±0.004	0.018±0.004	1.676±0.001	2.9±0.03
Ala.	2.40±0.3	0.173±0.04	0.087±0.003	0.867±0.002	0.124±0.005	-	1.081±0.001	1.2±0.004
Val.	3.30±0.1	0.106±0.01	0.089±0.03	0.840±0.003	0.188±0.006	-	1.012±0.04	2.5±0.001
Met.	-	-	0.099±0.003	0.069±0.003	0.083±0.001	0.097±0.001	0.216±0.01	-
Isol.	9.10±0.1	0.065±0.01	0.039±0.029	0.802±0.004	0.104±0.002	-	0.833±0.001	-
Leu.	2.7±0.1	0.136±0.02	0.082±0.01	1.399±0.004	0.218±0.001	0.055±0.001	2.045±0.001	2.7±0.001
Tyr.	-	-	0.211±0.02	0.362±0.005	0.272±0.001	0.199±0.001	0.611±0.001	-
Phen.	-	0.071±0.03	0.306±0.004	0.685±0.001	0.269±0.002	0.542±0.001	1.076±0.001	-
Lys.	6.90±0.3	0.094±0.04	0.854±0.001	1.494±0.001	1.589±0.04	0.783±0.001	1.943±0.001	2.4±0.001
His.	-	-	0.068±0.001	-	-	-	0.319±0.001	-
Arg.	-	-	-	0.265±0.001	0.075±0.003	-	0.763±0.001	-
Total	4.44±0.4	1.504±0.04	3.051±0.001	13.557±0.001	4.522±0.004	2.065±0.001	19.732±0.001	1.5±0.001

Amino acid	*R. saraba*	*C. forskalii*	*T. jarbua*	*L. brevirostris*	*Pomadasye* sp.	*L. lactrius*	*G. microlepis*
Asp.	0.0210±0.002	0.077±0.01	3.138±0.001	1.929±0.002	4.321±0.002	5.916±0.001	4.151±0.002
Thre.	-	0.058±0.02	4.118±0.001	1.397±0.002	1.299±0.003	1.912±0.002	1.588±0.003
Ser.	0.015±0.001	0.071±0.003	2.286±0.001	1.269±0.004	1.667±0.004	2.266±0.001	1.909±0.004
Glu.	0.054±0.001	0.143±0.002	4.161±0.001	2.184±0.005	5.587±0.003	8.084±0.001	8.842±0.001
Pro.	-	0.072±0.001	0.911±0.001	0.767±0.001	0.959±0.002	1.103±0.001	0.691±0.001
Gly.	0.015±0.007	0.049±0.001	3.123±0.001	2.283±0.002	2.784±0.001	29.716±0.001	2.315±0.002
Ala.	-	0.024±0.001	1.654±0.001	1.431±0.001	1.813±0.001	20.001±0.004	1.696±0.001
Val.	-	0.128±0.001	0.288±0.001	1.168±0.001	1.625±0.002	2.361±0.001	2.024±0.001
Met.	-	0.124±0.001	0.419±0.001	0.093±0.001	0.274±0.001	0.494±0.001	0.521±0.0021
Isol.	-	-	1.508±0.001	0.794±0.002	2.136±0.002	1.889±0.001	1.343±0.003
Leu.	-	-	2.356±0.001	1.634±0.02	2.499±0.001	3.915±0.001	3.497±0.002
Tyr.	-	0.566±0.001	1.057±0.001	0.529±0.03	1.936±0.003	1.271±0.001	1.219±0.001
Phen.	-	0.232±0.001	1.206±0.001	0.497±0.001	1.623±0.001	3.028±0.001	2.588±0.001
Lys.	0.213±0.001	0.123±0.0014	3.400±0.001	2.429±0.002	3.157±0.002	5.283±0.001	2.869±0.001
His.	-	0.112±0.001	0.203±0.001	0.112±0.001	0.731±0.001	1.534±0.001	1.089±0.001
Arg.	-	-	1.538±0.001	1.567±0.003	1.945±0.001	2.929±0.001	11.679±0.002
Total	0.01	3.079±0.001	32.371±0.002	20.089±0.001	33.538±0.001	46.970±0.001	37.921±0.002

Amino acid	*E. hamitonii*	*I. filigra*	*N. nasus*	*C. dorab*	*L. strongylocephalus*	*S. acutipinnis*	*A. dispar*
Asp.	4.239±0.001	2.958±0.001	5.176±0.1	0.491±0.01	1.179±0.003	6.458±0.001	6.451±0.01
Thre.	1.681±0.002	0.701±0.002	22.280±0.2	0.146±0.001	0.943±0.01	2.137±0.01	2.748±0.02
Ser.	1.109±0.003	0.350±0.001	16.406±0.3	0.231±0.001	0.084±0.02	1.868±0.01	3.109±0.02
Glu.	73.531±0.001	5.569±0.001	94.592±0.4	0.958±0.001	0.488±0.01	1.263±0.02	8.163±0.03
Pro.	10.000±1.023	0.872±0.001	10.623±0.5	0.075±0.001	0.313±0.01	1.256±0.03	0.838±0.04
Gly.	3.296±0.001	2.920±0.001	34.414±0.5	0.448±0.001	4.919±0.01	4.506±0.04	5.059±0.01
Ala.	2.316±0.001	1.581±0.001	32.009±0.6	0.171±0.001	1.718±0.2	2.777±0.05	3.819±0.01
Val.	2.204±0.002	1.483±0.001	28.145±0.2	0.149±0.001	1.591±0.3	3.406±0.06	3.197±0.01
Met.	60.296±0.001	0.395±0.001	0.494±0.4	0.041±0.001	0.274±0.02	1.194±0.06	1.197±0.01
Isol.	2.099±0.003	1.399±0.001	2.332±0.1	0.085±0.001	1.195±0.3	3.185±0.01	2.499±0.02
Leu.	3.962±0.004	3.121±0.001	5.042±0.2	0.276±0.001	3.551±0.1	5.557±0.02	5.616±0.01
Tyr.	0.041±0.001	2.676±0.001	1.486±0.3	0.372±0.01	1.505±0.1	2.509±0.01	2.509±0.01
Phen.	2.147±0.001	4.955±0.002	2.725±0.1	0.367±0.01	2.175±0.1	3.297±0.01	1.297±0.01
Lys.	5.727±0.002	3.818±0.002	5.810±0.1	3.378±0.02	5.512±0.1	7.885±0.02	7.235±0.1
His.	1.465±0.003	2.652±0.003	1.184±0.1	0.256±0.02	1.184±0.1	0.237±0.03	0.237±0.01
Arg.	1.751±0.004	3.645±0.003	1.595±0.1	-	0.107±0.1	2.908±0.04	2.908±0.1
Total	41.587±0.004	39.095±0.004	49.51±0.1	7.444±0.01	26.738±0.2	50.337±0.01	58.867±0.2

7

Table 3: A comparison between size of ediable fishes found in (A) trash and (B) found in commercial catch) (Munro, 1995; Qnreshi, 1955)

Name of Species	A (Inches)	B (Inches)
Carnx sexfaciatus	5.5-6.4	-
C. malbaricus	3.9-6.4	15.0
Johnius axillaries	2.7-8.5	10.5
J. Sina	5.0-7.7	48.0
Otolithus argenteus	8.9-10.2	30.0
Pertica filamentosal	2.1-3.9	10.0
Gerreomorpha setifer	2.2-3.1	5.0
Acanthopagrus latus	2.3-4.3	18.0
Rhabdoscargus sarba	3.5-4.4	18.0
Crenideus indicus	4.1-5.6	9.0
Crenideus forskalii	6.1-6.4	12.0
Therapon jarbua	2.0-6.4	10.0
Leiognathus brevirostris	2.4-6.3	54.0
Pomadasyas sp.	2.4-6.3	-
Lactarius lactarius	2.1-3.9	11.0
Gobius microlepis	2.3-6.5	-
Engarulis hamiltonii	5.6-7.3	8.0
Llisha filigra	5.2-7.3	21.0
Nematolosa nasus	6.0-7.5	108.0
Chirocentrus dorab	10.8-12.7	144.0
Liza strongy locephalus	2.2-6.5	10.0
Sphyraena acntipinns	1.7-6.4	20.0
Aphanius dispar	1.9-7.1	-

References

Afolobi, A.O. and B.L. Oke, 1981. Seasonal variability of nutritive value of the fish blue whiting (*Micromisistius poutassou*). Nutr. Rep. Intl., 24: 1251-1261.

Bramstedt, F.A.L., 1962. Amino Acid Composition of Fresh Fish and Influence of Storage and Processing. Fish In nutrition (Heen, E. and R.E. Kreuzer Eds.). Fishing News (Book) LTD. Ludgate House London, pp: 61-67.

Ekern, A., T. Homb, H. Hivdisten, O. Ulvesli and Breirem, 1962. Fish and Fishery Products in Ruminant Nutrition. Fish in Nutrition (Heen, E. and R. Kreuzer Eds.). Fishing news (Book) LTD. Ludgate House London, pp: 324-330.

Ghu, B.C., 1992. The Role of Fish in Human Nutrition. Fish in Nutrition (Heen, E. and R. Kreuzer Eds.), Fishing News (Books) LTD. Ludgate House, London, pp: 39-42.

Gras, J., Y. Gudefin and I. Chagny, 1978. Free amino acids and ninhydrin positive substance in fish 1. Muscle and skin of rainbow trout (*Salmo gaitdneri Richardson*). Comp. Biochem. Physiol., 60: 369-372.

Haq, S.A., I.H. Siddiqui and K.L. Rizvi, 1974. The studies of fish hydrolyzates and fish extracts from teleostearn fishes of the Arabian Sea. Pak. J. Sci. Ind. Res., 17: 85-88.

Haris, R.S., 1964. Fishery By-products Technology. West port Connecticut.

Hawk, B.P., L.B. Oser and H.W. Summerson, 1954. Practical Physiological Chemistry. 13th Edn., Mc Graw Hill Book, Co. Inc. New York, Toronto and London.

Hung, L., T. Sohenda, J. Slembrouck, J. Lazard and Y. Morcau, 2004. Comparison of dietary protein and energy utilization in three Asian catfishes (*Panagasius bocouti, P. hypohthalmus* and *P. djambal*). Aqua. Nutr., 10: 317-326.

Ivor, C., 1997. A study of the options for utilization of bycatch and discard from marine. FAO fish Circular, Rome FAD., pp: 59.

Jacobsen, J.A. and L.P. Hansen, 2000. Feeding Habit of Altantic Salman at Different Life Stages at Sea in the Ocean Life of Altantic Salmon. Fishing News Books, (Hill, D., Ed.) Black Well Science Oxford.

Lall, S., 2000. Rate of nutrition in fish health. Intl. Aqua., 2: 10-14.

Medford, B.A. and W.C. Mackay, 1978. Protein and lipid content of gonads liver and muscle of northern Pike (*Esolucius*) in relation to gonad growth. J. Fish. Resh. Board Can., 35: 213-219.

Mesck, G., 1962. Importance of Fisheries Production and Utilization in the Food Economy. In: Fish in nutrition (Heen, E. and Kreuzer, R. Eds.). Fishing News (Book) Ltd. Ludgate House London, pp: 23-28.

Munro, S.R., 1955. The marine and fresh water fishes of Ceylon. Department of External Affairs, Canberra.

Nakagwa, H. and M. Kayama, 1978. Biochemical studies on crop plasma protein. 2. Amino acid composition of an albumin. Bull. Jap. Soc. Sci., Fish., 44: 359362.

Nwanna, L.C., 2003. Nutritive value and digestibility of fermented shrimp head waste meal by African cat fish *Clarias gariepinus*. Pak. J. Nutr., 2: 339-345.

Qudrat-i-Khuda, H.N. De and N. Khan, 1962. Biochemical and nutritional studies on East Pakistan fish. Part V. Influence of age of fish on the distribution of protein in their body. Pak. J. Sci. Ind. Res., 5: 20-30.

Qudrat-i-Khuda, H.N. De, N.M. Khan and J.C. Debnath, 1962. Biochemical and nutritional studies on East Pakistan fish. Part VII. Chemical composition and quality of the traditionally processed fish. Pak. J. Sci Ind. Res., 5: 67-69.

Qureshi, R.U., 1955. Marine fishes of Karachi and the coasts of Sindh and Makran. Government of Pakistan Press, Karachi.

Scrimshow, N.S. and R. Bressani, 1960. Vegetable protein mixture for human consumption. Processing. Fish. International Congress on Nutrition, Panel. Washington DC.

Stansby, M.E., 1962. Proximate Composition of Fish. Fish in Nutrition (Heen, E. and R. Kreuzer Eds.), pp: 55-60.

Yousif, M.H. and M.E. Hindik, 1965. Comparative study of chemical composition of Damietta and Zuersardins. J. Arab. Vet. Med. ASS., 25: 125-128.