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Evaluation of Amino Acid Profile for Freshwater Fishes Yellow Barbell *(Carasobarbus luteus)* and Common Carp (*Cyprinus Carpio)* of Euphrates River, Iraq

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Abstract: The present investigation was carried out to evaluate the amino acids composition of two important commercial freshwater fish yellow barbell (*Carasobarbus luteus*) and common carp *(Cyprinus carpio*) of Euphrates River. The chemical analysis was conducted and the results showed that total protein content (% dry weight) for *C. luteus* and for *C. carpio*was 26.12 and 22.59%, respectively. The total fat content was 2.17 % and 4.04 % for *C. luteus* and *C. carpio,* respectively. The ash content for *C.luteus* was 1.5% and *C. carpio* was 2.96% while moisture content 71.15% for *C. luteus* and 71.0% for *C. carpio*, Amino acids ranged from 0.56 - 14.03% for *C.luteus* and 0.7- 13.11% for *C. carpio* fish. The most present amino acids were glycin, aspartic, tryptophan, and glutamic, which ranged from 8.22 to 14.03%. The essential amino acids in the two species were arginine, histidine, isoleucine, leucine, phenylalanine, threonine, tryptophan, and valine were detected. The percentage ranged from 0.56 - 11.69% for essential amino acids in two species to improve good health, protection, and reduce of diseases in humans and therefore an important source of nutrients.

Keywords: Amino acids, *Carasobarbus luteus*, *Cyprinus carpio*, HPLC, Protein

Fisheries and aquaculture play an important role in the economy of many developing countries around the world, particularly in Asia and Africa. Fishes and fish products are considered to be the most widely traded commodities in the world (Martini and Lindberg 2013). Freshwater fish are an important source of protein and unsaturated fatty acids (USFA) (Ljubojevic et al 2013) and are protein rich in essential amino acids like (lysine, methionine, cysteine, threonine, and tryptophan) (Sikorski 1996).

Humans have used fish as a food throughout the ages as an easily digestible food; as it is rich in protein and fat and also for treat numerous diseases, like prevention of pulmonary tuberculosis and weak liver function (Craig and Helfrich 2002). Fish muscles are the main and important part of human consumption, so their composition of proteins, especially their essential amino acids, should be known in the human diet (Ackman 1990). Limin et al (2006) noted that the total of amino acid content in fish is influenced by internal factors such as (species, size, sexual maturity) and other external factors for example (food type, fishing season, salinity, temperature). Also, it is affected by season and location, there is a strong relationship between the pattern of the content of essential amino acids found in fish body tissue and the pattern of dietary requirements for each species (Wesselinova 2000). There are several studies on the quantitative and qualitative properties of amino acid composition in many species (Ovissipour et al 2009, Kenari et al 2009, Dezhabad et al 2012). *Carasobarbus luteus* and *Cyprinus carpio* belong to the same family Cyprinidiae. Omnivorous feedings and dominant groups present in the Euphrates during the seasons of the year (Amari et al 2012). They are considered to be economically important species and are widespread in many freshwater bodies, especially in central and southern Iraq (Al-Tamimi 2004). *C. luteus* is an Iraqi fish found in inland waters (Coad 2017). While *C. carpio* was introduced to Iraq during 1955-1956 by the first of Indonesia (Pantene carp) and the second from the Netherlands (Japanese multi -color carp) for breeding at the Zaafarania fish farm in Baghdad and then launched into the natural water bodies in the Alhammar and Sunni marshes and the lakes of Habbaniyah and Tharathar n 1965 (AL Hamed 1971, Al-Rubaie 1986). In 2009, the *C. carpio* was imported from Henkaria by private sector companies considered as one of the most important economic fish cultivated in Iraq, it is the first in the field of cultivated (Hassouni and Janabi 2005). Al-Amari et al (2012) has reported that, algae are the main food for *C. luteus*, followed by aquatic plants, organic crumbs, and diatoms with a tendency to plant species. In the study of Mohammed et al (2015) pointed out the *C. luteus* in the East Alhammar marsh adoption in feeding on twelve different types of natural food, the diet included diatoms, phytoplankton, algae, and aquatic plants. *C. carpio* feed on natural foods in their external environment and commercial diet in different farming systems (Kocour et al 2007). The common commercial diet used to feed *C. carpio* made from cereals, soybeans, fishmeal and supplemented with

vitamins, minerals and possibly some feed additives, which are in the form of Peale at, such as sinking and floating. These feeds are largely used in intensive culture systems (cages) and semi-intensive culture, clay ponds (Deutsch et al 2007).

Natural foods are a valuable source of proteins (essential amino acids), fatty acids and vitamins, which determine the nature of the nutritional value of each type of fish meat used in human nutrition (Kibria et al 1997).Therefore, it is necessary to study and measure the content of amino acids in the tissues and muscles of each type of fish, to determine the optimal type of fish in human nutrition. The current study aimed to know the composition of amino acids for two types of freshwater fish including *Carasobarbus luteus* and *Cyprinus carpio* located in the inland waters of Iraq.

MATERIAL AND METHODS

Collection of samples: *Carasobarbus luteus* was obtained from the fishermen of the Euphrates River, and *Cyprinus carpio* was obtained from the floating cages farms on hours. The total protein in the muscles of the fish was determined by the Kjeldahl method. Measure the total nitrogen content in the sample after digesting a known weight with the sulfuric acid (H_2SO_4), the distillation with per chloricacid ($HCLO_4$) and the hydrochloric acid (HCL) correction, then multiply the nitrogen value by a factor (6.25N) to convert total nitrogen to crude protein (CP)in all fish samples. Ash was determined in the dry sample by taking 5g of the sample and then placed in furnace at 550°C for 8 hours. The crude fat was extracted from the fish muscles by the organic solvent petroleum ether by using the Soxlet.

Analysis of amino acids: The amino acid profiles of raw fish muscles are determined by (HPLC) High-Performance Liquid Chromatography analysis according to Vidotti et al (2003) by using the cationic exchange resin column and ninhydrin post-column derivation in auto analyzer (Shimadzu SPD-6AV UV-visual detector). Samples were analyzed using HCl 6N, for 22 h at 110°C to determine amino acids. Sinceacidic hydrolysis destroys tryptophan, the samples were also analyzed using lithium hydroxide 4N to determine tryptophan. When you combine the replicas together, one value for each material was obtained and used. The tests were conducted at the laboratories of the Ministry of Science and Technology, Baghdad.

Statistical analysis: Use the statistical program Statistical Analysis System (SAS 2012). The mean differences between the averages were calculated by Duncan (1955).

RESULTS AND DISCUSSION

Proximate composition: The proximate composition calculated on the dry matter of the two freshwater species *C. carpio* and *C. luteus* shown in Table 1.

Content of protein: Content of protein for *C. carpio* ranged from 22.18 to 22.67% While we noted that *C. luteus* spread from 25.87% to 26.45%. The mean Content of protein spread from 22.59% for*C. carpio* to 26.12% for *C. luteus*. Note significant differences ($p< 0.05$) between the species. Record the highest protein content in *C. lute.*

Content of lipid: The lipid ratio of *C. carpio* ranged from 3.76-4.2% and for *C. luteus* 2.03-2.4%. The average total content of lipid ranged from 4.04- 2.17% with significant differences ($p< 0.05$) between species. The highest lipid content was recorded in *C. carpio*.

Content of ash: The content of ash for *C. carpio* ranged from 2.87- 3.09 % and 1.22-1.66% in *C. luteus.* The average total content of ash for 2.69-1.5%. The highest ash content was noted in *C. carpio.*

Content of moisture: The content of moisture ranged from 70.58 to 71.18% with average of 71.0% for *C. carpio* and 70.85 to 71.53% and average of 71.15% for *C. luteus*. No significant differences were observed ($p< 0.05$) between species.

Relative volume: Relative volume ranged from 0.37 to 0.43 with average of 0.403 in *C. carpio* and 0.33 to 0.375 and average 0.359 for *C. luteus*. No significant differences were observed ($p< 0.05$) between species**.**

Amino acid content: Eighteen different amino acids were found from fish under study. The total amino acids for *C. carpio* was 225.39 mg g^{-1} and in *C. luteus* was 261.21 mg g^{-1} (Table 2). Eight of the essential amino acids that are very important to human health are present in the fish understudy. These essential amino acids are arginine, histidine, isoleucine, leucine, phenyl al., tryptophan, threonine andvaline. Total essential amino acids 36.87% for *C. carpio*

Table 1. Estimation of ingredients (dry matter) of *C. carpio* and *C. luteus*

Parameters	*C. carpio*	*C. luteus*
Weight (g)	250.66 ± 26.59	76.366 ± 3.43
Total length (cm)	25.433 ± 1.23	18.066 ± 0.52
Standard Length (cm)	20.233 ± 2.13	15.233 ± 0.54
Depth of body (cm)	8.10 ± 0.58	5.466 ± 0.12
Relative Volume	0.403 ± 0.01	0.359 ± 0.01
Crude protein (% w/w)	22.593 ± 0.2b	26.121 ± 0.17a
Crude fat (% w/w)	4.044 ± 0.13a	2.173 ± 0.11b
Crude Ash (% w/w)	2.961 ± 0.06a	1.503 ± 0.13b
Dray matter	28.993 ± 0.21a	28.846 ± 0.19a
Moisture (% w/w)	71.006 ± 0.21a	71.153 ± 0.19a

a, b The different letters in column means that significant differences ($P <0.05$)

Table 2. Amount of amino acids of total protein

No.	Amino acids mg g^{-1}	*C. carpio*	*C. luteus*
1	Arginine	5.94a	10.95a
2	Histadine	8.12a	10.41a
3	Isoleucine	10.37b	12.85a
4	Leucine	15.8a	16.085a
5	Phenyl al.	5.00a	7.78a
6	Threonine	14.03a	13.4a
7	Tryptophan	22.39a	30.54a
8	Valine	1.64a	1.47a
Sum	ΣEssential amino acids (EAA)	83.31a	103.51a
9	Aspartic	16.72b	36.65a
10	Serine	13.11a	15.31a
11	Glutamine	18.57a	16.99a
12	Glycine	29.63a	20.78b
13	Alanine	7:00 AM	8.9a
14	Tyrosine	8.62a	6.59a
15	Glutamic, A.	13.15a	9.95b
16	Ornithine	8.84a	7.55a
17	Asparagin	12.82a	15.54a
18	Taurine	14.12a	19.39a
Sum	Σ Non Essential amino acids	142.62a	157.7a
Sum	Total amino acids	225.39	261.21
	EAA/NonEAA	0.584a	0.666a

a, b The different letters in column means that significant differences (P <0.05)

Table 3. Proportion of amino acids in total amino acids

No.	Amino acids (%)	*C. carpio*	*C. luteus*
1	Arginine	2.626 ±0.41a	4.192±0.87a
2	Histadine	3.597±0.21a	3.986±0.78a
3	Isoleucine	4.591±0.17a	4.922±0.05a
4	Leucine	6.996±0.19a	6.157±0.63a
5	Phenyl al.	2.214±0.38a	2.980±0.96a
6	Threonine	6.209±0.28a	5.131±0.93a
7	Tryptophan	9.910±0.82a	11.691±1.70a
8	Valine	0.727±0.04a	0.563±0.11a
Σ	EAA	36.875±0.99a	39.626±3.21a
9	Aspartic	7.403±0.50b	14.031±2.24a
10	Serine	5.802±0.88a	5.864±0.36a
11	Glutamine	8.222±0.60a	6.504±0.81a
12	Glycine	13.115±0.82b	7.955±0.16a
13	Alanine	3.099±0.15a	3.409±0.26a
14	Tyrosine	3.817±0.31a	2.526±0.54a
15	Glutamic,A.	5.821±0.24a	3.811±0.37b
16	Ornithine	3.916±1.26a	2.893±0.62a
17	Asparagin	5.674±0.37a	5.952±0.51a
18	Taurine	6.250±0.32a	7.424±0.79a
Σ	Non EAA	63.124±0.99a	60.373±3.21a
Sum	EAA/NonEAA	0.584±0.02a	0.666±0.09a

a, b The different letters in column means that significant differences (P <0.05)

and 39.62% for *C. luteus showed* significant difference at 5% level of significance between species percentage of each amino acid of total amino acids are shown in Table 3. The highest percentage of amino acids were aspartic acid, glycine, tryptophan and glutamine spread from 8.22-14.03% of total protein. While the ratios of other amino acids 0.72 to 13.11% in *C. carpio* and 0.56 to 14.03% in *C. luteus*.

Essential amino acids cannot be manufactured within the human body so they get them in a large and balanced intake of fish meat, they are important for healing wounds (Mat Jais et al 1994). The present study indicated that both types contain most of the essential amino acids.

Obstruction in the healing process occurs when there is a lack of essential amino acids (Mat Jais et al 1994). To ensure the formation of hemoglobin and regulate the stability of sugar and energy in the blood, the body needs Isoleucine. While leucien plays a major role in the healing of skin, boneand muscle tissue, and for the formation of human glycogen, Glycine is considered to be a key ingredient (Heimann 1982, Witte et al 2002).

The importance of Glutamine is concentrated in its work as an important carrier of ammonia (nitrogen) in the immune system of the muscles in the case of dangerous diseases. (Deutz et al 1992). The results showed that the amount of amino acids in *C. luteus* is higher than in *C. carpio* and this is due to the nature of nutrition of each species. Where *C. luteus* relies heavily on natural food while *C. carpio* feeds on commercial foods (Fadaee 2012).

CONCLUSION

To sum-up, fishes are considered an important source of human food in Iraq, because it contains a high percentage of protein and a good source of amino acids, especially essential amino acids, which is in good quantity for good health and prevention of diseases in humans.

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