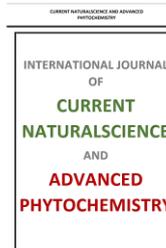




**INTERNATIONAL JOURNAL OF CURRENT  
NATURALSCEINCE AND ADVANCED  
PHYTOCHEMISTRY**

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**INVESTIGATION OF AMINO ACID PROFILES IN CYPRINUS CARPIO AND  
ARABIBARBUS GRYPUS SPECIES LIVING IN THE EUPHRATES RIVER**

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**ARTICLE INFO**

**Keywords**

Euphrates River,  
Arabibarbus grypus,  
Cyprinus carpio,  
Amino acid, Nutrition

**ABSTRACT**

It is necessary to benefit from fish products due to the high quality of the protein in order to meet the animal protein need in a healthy diet. For this reason, many fish species are hunted and consumed by humans. *Arabibarbus grypus* and *Cyprinus carpio* species are among the most delicious fish that live in the Euphrates, caught and sold by fishermen. In this study, data on the amino acid profile of muscle tissue consumed as food in two target species were investigated. Fish samples were randomly selected from among the samples sold by local fishermen and muscle tissue was taken from 30 individuals for each species. Amino acid profile analysis was performed on LC-MS/MS 8045 instrument using commercial kit. The absorbance results obtained from the device were analyzed and evaluated. Accordingly, the highest value in *C. carpio* species; Histidine with 788.71, the lowest with 0.20 Carnosine; In the *A. grypus* species, the highest value Histidin with 1435.82, and Cystine with 0.59 as the lowest which were determined. As a result of this study, the amino acid profile of the two most consumed target species living in the Euphrates River systems was examined for the first time.

**Introduction**

The need for proteins, which is an important requirement in human nutrition, is increasing

day by day due to the increase in population, and freshwater fish are becoming an alternative protein source in response to inadequate terrestrial products. Fisheries and

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Received 9 December 2021; Received in revised form 10 December 2021; Accepted 21 December 2021

Available online 25 December 2021

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aquaculture play important roles in providing food and income in many developing countries (Frag, Abdelnour, Patra, Dhama, Dawood, Elnesr, et al., 2021; Parmaksiz, 2020, 2021). In the last few decades, the aquaculture industry has witnessed a large-scale development that produces high employment and nutrient-rich foods for human consumption (Alagawany, Farag, Abdelnour, & Elnesr, 2021; Pradeepkiran, 2019; Saeed, Arain, Ali Fazlani, Marghazani, Umar, Soomro, et al., 2021). Due to the high quality of fish protein, there is a great demand and investment in this sector is extremely advantageous (Frag, et al., 2021). Freshwater fish are both an excellent source of animal protein and a source of income for people living in areas close to freshwater reservoirs, especially in developing countries (Fawole, Ogundiran, Ayandiran, & Olagunju, 2007; Mohammed & Alim, 2012; Osibona, 2011). The Euphrates River, one of the important rivers of Turkey, is an important natural resource in terms of fish diversity and fishing potential and creates a great potential in terms of meeting the nutrient deficit (Bilici, 2013; S. A. Oymak, Karadede-Akin, & Dogan, 2009). In this system, which includes many fish species, *Arabibarbus grypus* and *Cyprinus carpio* species are among the most delicious fish caught and sold by fishermen. These species, which are the most preferred by humans, constitute an important food source of animal protein for balanced and good nutrition and play a key role in healthy nutrition (Palali, 2019). Information on the amino acid profiles of fish meat is very important in determining the suitability of fish as a protein supplement (Hussain, Sultana, Sultana, Ahmed, & Mahboob, 2018).

In this study, it was aimed to determine the nutritional value in terms of amino acid profile

by taking muscle samples of *Arabibarbus grypus* and *Cyprinus carpio* species, which are caught from the Euphrates and sold by fishermen. Because the most important factor affecting the effectiveness of protein use is the amino acid profile, and the dietary amount and quality of proteins depends on the source of the food.

### Material and Methods

The fish materials used in our study consist of fish living in the Euphrates River, which are fished by local fishermen with the help of nets. To be selected randomly, 15 Siverek for each species and 15 individuals from Bozova districts, a total of 30 individuals, were taken from each fish as 100 mg/ml muscle tissue, and put into numbered 2 ml microcentrifuge tubes (Figure 1). In order to homogenize the muscle tissues, 1X PBS was added to the tubes in the homogenizer and mixed with the help of metal balls for 2 hours at +4 °C, and this process lasted for 2 hours. Then, centrifugation was performed at 15000 rpm for 15 minutes and the solution was purified from particles. The resulting supernatant was transferred to new microcentrifuge tubes and kept at -80 °C until the amino acid profile was determined. Amino acid profile analysis was performed on LC-MS/MS 8045 device using Jasem LC-MS/MS amino acid analysis kit. 50 µl of the homogenized sample was taken into new tubes, 50 µl of internal amino acid standard was added to them, and the samples were mixed thoroughly and the mixture was prepared and 700 µl of amino acid Reagent 1 was added and centrifuged at 3000 rpm for 5 minutes. After centrifugation, approximately 150-200 µl of supernatant was taken from the supernatant and transferred to vials with inserts, and each sample was analyzed in the LC-MS/MS-8045 device for 5 minutes and the

absorbance results were evaluated. The conformity of the data to normal distribution was tested with the Shapiro Wilk test, the Mann-Whitney U test was used for the comparison of numerical variables between two independent groups, and the Kruskal Wallis test was used for non-normally distributed features. As descriptive statistics,

numbers and % values were given for categorical variables, and mean±standard deviation for numerical variables. SPSS Windows version 25.0 package program was used for statistical analysis and  $P < 0.05$  was considered statistically significant.



**Figure 1.** Removal of individuals and muscle tissue from the species used in the study (A: *Arabibarbuser grypus*, B: *Cyprinus carpio*, C: Removal of Muscle Tissue, D: Preservation of muscle tissue in tubes)

## Results

In this study, the amino acid profile of *A. grypus* and *C. carpio* species, which live in the Euphrates River, are hunted by local fishermen and are mostly consumed by humans, were determined for the first time by applying the necessary conditions with LC-MS/MS device (Table 1).

Table 1 shows the mean values (Mean), standard deviations (SD) and p values between the two groups of amino acids and metabolic amino acids obtained from both fish species. Accordingly, the highest value in *C. carpio*

species; Histidine with 788.71, the lowest with 0.20 Carnosine; In the *A. grypus* species, the highest value was identified as Histidin with 1435.82. Also, Cystine was detected as the lowest value (0.59). A statistically significant difference was found in the mean amino acid averages of *C. carpio* and *A. grypus* groups, 1-MHIS, 3-MHIS, Arg, Asp, Cystine, Cystathionine, Gln, His, Carnosine, and Ortopospo Serine measurements ( $p < 0, 05$ ). The amino acid averages of the *A. grypus* group (1-MHIS, 3-MHIS, Arg, Asp, Cystathionine, Gln, Her, Carnosine, and Ortopospo Serin) were significantly higher than the *C. carpio* amino

acid averages. In addition, the mean of Cystine amino acids of *C. carpio* groups was significantly higher than the mean of amino acids of *A. grypus*.

**Table 1.** Amino acid amounts (100mg/ml) detected in muscle tissue of *C. carpio* and *A. grypus* species

Amino acid	<i>Cyprinus carpio</i>		<i>Arabibarbus grypus</i>		p
	Mean	SD	Mean	SD	
<b>1-Mhis</b>	2,14	1,18	9,67	4,16	<b>0,001</b>
<b>2-Aminoadipic Acid</b>	1,31	1,03	2,34	3,06	0,495
<b>3-Mhis</b>	0,30	0,14	1,31	0,82	<b>0,001</b>
<b>4-Oh-Proline</b>	5,60	3,67	9,41	7,76	0,133
<b>Ala</b>	159,37	123,93	174,98	70,36	0,339
<b>Arg</b>	27,80	19,15	52,44	31,50	<b>0,024</b>
<b>Asn</b>	3,79	1,83	3,01	3,05	0,116
<b>Asp</b>	265,88	172,82	311,67	162,57	<b>0,006</b>
<b>Cit</b>	7,24	15,06	2,40	2,51	0,375
<b>Cystine</b>	0,94	0,46	0,59	0,20	<b>0,024</b>
<b>Cystathionine</b>	3,06	2,34	21,94	12,01	<b>0,001</b>
<b>Gln</b>	10,39	9,85	21,64	10,76	<b>0,034</b>
<b>Glu</b>	187,05	225,77	189,30	102,51	0,246
<b>Gly</b>	692,87	477,72	529,15	448,01	0,246
<b>His</b>	788,71	218,68	1435,82	342,82	<b>0,001</b>
<b>Lys</b>	202,56	227,22	152,00	109,98	0,891
<b>Met</b>	22,88	35,00	13,77	10,87	0,946
<b>Orn</b>	3,25	3,28	4,83	2,72	0,065
<b>Phe</b>	27,32	31,87	17,53	17,89	0,056
<b>Pro</b>	70,30	64,69	114,31	118,45	0,306
<b>Ser</b>	50,03	35,31	34,75	13,09	0,495
<b>Thr</b>	36,33	20,16	49,25	29,92	0,339
<b>Trp</b>	4,72	4,17	6,12	4,52	0,152
<b>Tyr</b>	15,69	20,02	14,19	11,42	0,195
<b>Val</b>	53,01	58,47	37,41	22,31	1
<b>Carnosine</b>	0,20	0,02	1,16	0,65	<b>0,041</b>
<b>Gaba</b>	6,77	9,47	7,08	4,55	0,195
<b>Homocitruline</b>	1,09	0,50	0,84	0,51	0,172
<b>Norvaline</b>	1,47	1,60	1,00	0,58	0,682
<b>Sarcosine</b>	135,01	78,25	148,16	21,66	0,101
<b>Glutamic_Acid</b>	274,34	329,37	260,11	133,34	0,339
<b>Ortopospo_Serin</b>	0,78	0,38	0,94	0,31	<b>0,002</b>
<b>Ortophosphoryletanolamin</b>	6,23	3,06	3,74	1,62	0,056

## Discussion

Fisheries are important natural living resources that contribute to the economy of countries in return for a certain investment and effort, today and in the future. In addition to providing support to the country's economy, its contribution to human nutrition is also important (Necmettin, 2007). In order to meet the animal protein needs of a balanced and healthy diet, it is necessary to benefit from sea and inland fishery products at a high rate (Necmettin, 2007). It is known that people living in areas close to water sources consume more fish (Özbay, Özoğul, Av, & ABD, 2020).

About 28 fish species belonging to eight families live in the Euphrates River and the dam lakes established on it, and some of them have economic value and are hunted by the fishermen of the region (S. Oymak, 1998). The information obtained from people who have been fishing for many years and as a result of the observations and evaluations made by us, *Arabibarbus grypus* and *Cyprinus carpio* species are among the most preferred fish by the local people. These species are popularly known as Şabut (*A. grypus*) and Carp (*C. carpio*). Carp is the second most important fish in the world after trout in inland fish farming, and Şabut is a species that can be an alternative to carp and trout in inland fish farming in the Southeastern Anatolia region (Atar & Ateş, 2009). It is necessary to reveal the nutritional values of

these species, which are of such importance, especially the protein quality.

In this study; The amino acid profile in muscle tissue was studied for the first time for *A. grypus* and *C. carpio* species living in the Euphrates River. Accordingly, the three amino acids with the highest values detected in fish muscles are respectively; for *A. grypus*, Histidine > Glysin > Aspartic acid; For *C. carpio*, it is Histidine > Glysin > Glutamic acid. In similar studies; Valine > Glutamic acid > Aspartic acid for *Carasius gibelio* species (Eneş, 2019). In the study conducted for *Engraulis encrasicolus* (Anchovy fish), it is Glutamic acid > Aspartic acid > Lysine (Bilgin, Çarlı, Erdoğan, Maviş, Gursu, & Yılmaz, 2018). When examined in general, it was determined that the values of *A. grypus* and *C. carpio* species were similar and close to each other, and the values of *C. gibelio* species were more different than both species. Therefore, the use of these types in the preparation of some protein diets will provide more richness in terms of amino acids. It can be used to enrich the content, especially when it is converted into amino acid supplemented products that are consumed heavily by athletes and imported from abroad to our country.

**Description:** This study is the summary of the master's thesis titled "Investigation of amino acid profile in *Arabibarbus grypus* and *Cyprinus carpio* species living in the Euphrates".

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