Estimating the chemical components of *arabibarbus grypus* (Heckel,1843)

Doaa H.H. AL-Turfi[1], Mohammed W.H. AL-muhanna[1] and Kadhim O.M AL-Humairi[2]

[1]Department of Biology, College of Education for Pure sciences, University of Kerbala, Iraq
[2]Al-Furat AL- Awsat Technical University, AL- Musaib Technical College, Babylon, Iraq

Abstract

Included a study to find out the chemical composition of *Arabibarbus grypus* (Heckel,1843) belonging to the Cyprinidae family, which includes: protein content, fat content, moisture content, ash content, and calorie values. In two different areas of the body: R1 and R2, 50 samples of study fish were collected from the Indian Shatt in Karbala province and between (September 2021 and November 2021) using gill nets And the hand-throwing nets and with the help of the area's fishermen.The results of the current study showed a difference in the values of chemical component rates in the muscles of the study fish, as the overall rates of protein content values in of *Arabibarbus grypus* ranged from (16.72 - 17.52) %, while the overall rates of values of the fat content of *Arabibarbus grypus* ranged from (5.95- 8.24)%, and the overall rates of moisture content values in *Arabibarbus grypus* ranged from (70.34-67.01) %, while the overall rates of ash content ratios in *Arabibarbus grypus* ranged from (6.22-6.70) %. Proven results.

Keywords: chemical components, arabibarbus grypus, Heckel 1843

Introduction

The world's attention has turned to fisheries to fill the shortage of animal protein after the increase in population and the depletion of natural resources (Henchion *et al*., 2017), and it is one of the most important sources of national income for many countries, especially developing ones, through fishing and aquaculture revenues in many countries. These countries (Al-Ta'i and Zangana, 2011).

This wealth is one of the important food sources that provide good animal protein by (24%) compared to other meat in which good protein is available by (40%) (Naif, 2005), and it also contains all the vitamins and minerals necessary for humans in varying proportions depending on their type (Pal *et al*.,2018); Therefore, the consumption of fish has increased significantly during the last two decades (FAO, 2016), due to its positive effects on human health (Tilami *et al*., 2018), as it contains essential amino acids that cannot be manufactured inside the human body (Oluwaniyi *et al.* ., 2010).

Arabibarbus grypus belongs to the family Cyprinidae, and it belongs to the genus *Barbus* and then was changed and placed within the genus *Arabibus* (Borkenhagen, 2014)), and it is one of the types of river fish found in Iraq, where it has great economic importance as it was occupied previously and for the period between (1967 -1970) ranked third in the total

contribution to the national income, sales of which were about 519 tons annually, but at the present time this percentage has declined significantly (Coad, 2010).

As for the chemical components of fish muscles from protein, fat, moisture, minerals, vitamins and polyunsaturated fatty acids all contribute to muscle formation and these components can vary according to their function and availability (Shearer, 1994).

Materials and working method

Samples of *Arabibarbus grypus* fish were collected(50) from Shatt Al Hindiya (Euphrates River) from different locations within the Shatt area in the same Al Hindiya district for the period from the beginning of September 2021 to the beginning of November 2021, using Gill nets with different dimensions ranging between (5.3 - 5.6 cm) in order to catch different sizes of fish. The gill net is connected to cork rafts to lift it up. The samples were transferred to the Graduate Studies Laboratory in the Department of Life Sciences at the College of Education for Pure Sciences / University of Karbala by cork containers filled with ice to maintain the freshness of the fish until reaching the laboratory, The fish were washed and divided according to classification sources, and phenotypic measurements were taken, represented by measuring the total length to the nearest one mm and weight to the nearest (0.1) g in preparation for conducting the tests referred to within the current study.

statistical analysis

The differences between the averages of the total length of fish and the estimation of the chemical content (protein, fat, moisture and ash) in the studied body regions (R1 & R2) were tested using the T-test at the level of significance (0.05), and the relationships in the variables were also studied to calculate the Correlation Coefficient (r), and the regression equations were calculated for each relationship according to the statistical program (SPSS 16) Statistical Package for Social Sciences 16.

Results

The results of the current study showed that the percentages of the total average of protein content in *Arabibarbus grypus* ranged between (16.72-17.52 %), while the values of the total rates of fat content in *Arabibarbus grypus* ranged (5.95 -8.24%), while the moisture content of *Arabibarbus grypus* ranged between (70.34- 67.01%), while the values of the total rates of ash content in *Arabibarbus grypus* ranged between (6.22 -6.70%), as shown in Table (3).

The results of the current study showed that the percentages of protein content in *Arabibarbus grypus* differ according to the different body regions studied (R2, R1) and to different total weights, as the protein content ranged between (16.98-18.02%) and (16.47-17.03%) in the studied body areas (R2, R1) respectively, as shown in Table (1), and it was noted that the values of the protein content rates increase with the increase in fish weights, and this was indicated by the values of the correlation coefficient (r) (0.947) in *Arabibarbus grypus*, and this indicates a direct relationship between the protein content rate and the rate of Fish weights, that is, the higher the weight of the fish, the higher the protein content in it, as shown in Figure (6).

The percentage of the fat content of *Arabibarbus grypus* ranged in the anterior region (R1) (5.93-8.21%), while it was in the rear region (R2) (5.98-8.27%), meaning that the fat content in the rear region is higher than the frontal region, as shown in the table (1), and it was noted that the values of the rates of fat content increase with the increase in fish weights, and this was indicated by the values of the correlation coefficient (r) which was (0.969) for the *Arabibarbus grypus* fish, and this indicates a direct relationship between the average of the fat content and the average weight of the fish, meaning the more fish increased in weight, the more The fat content in it is as shown in Figure (8), and this means that the values of the fat content differ according to the regions of the body studied, while the moisture percentage in the *Arabibarbus grypus* in the front region (R1) ranged between (70.96-68.02%), while the moisture content in (R2) (69.72-66.01%) as shown in Table (1), and it was noted that moisture rates decrease with increasing fish weights, and this was shown by the values of the correlation coefficient (r) that was between (0.988) for *Arabibarbus grypus*, and this indicates an inverse relationship between Moisture content rate and fish weight average, i.e. the higher the fish weight, the lower the moisture content as shown in Figure (10), as for the percentage of ash in (R1) ranged between (6.61-7.21%), while the percentage of ash content in (R2) was (5.84-6.20%) as shown in Table (1), and it was noted that the values of ash content It increases with the increase in the average fish weight, and this is indicated by the values of the correlation coefficient (r) which was (0.894) in the, *Arabibarbus grypus*, and this indicates a direct relationship between the average ash content and the average fish weight, that is, the higher the fish weight, the higher the ash content in it, as shown In Figure (12).

Discussion

Fish and its products are an essential food source for humans; Because it contains the main components represented by high proportions of proteins and fats and small amounts of vitamins and minerals (Awda, 2012), the results of the current study showed a difference in the proportions of the chemical components of the two regions(R1, R2) represented by the protein, fat, moisture and ash content, where this difference depends on the fish species In addition, the chemical composition does not differ between fish species only, but also varies between individuals of one species. There are some external and internal factors that affect the chemical composition, including season, environmental location, nutrition, species, size, sex, reproductive cycle, and muscle location in the body. The fish, maturity (Mansour 2018) .

Al-Shatti,(2006) indicated when studying some fish species that there is an inverse relationship between the percentage of protein and the percentage of fat in body areas, and these results are consistent with the results of the current study, which proved that the percentage of protein content is higher than the percentage of fat content in the muscles of the fish of the current study.

The results of the current study showed that there is a clear difference in the percentages of fat content, as the percentage of fat content in the posterior region (R2) is higher compared to its percentage in the anterior region (R1).

The results of the current study showed that there is a direct relationship between the percentage of fat content and the weight of the fish in the areas of the body studied. The

higher the weight of the fish, the higher the percentage of fat content, especially in the back area (R2); Because of the increase in the percentage of red muscle fibers, and this agrees with what was reached by (Al-Hasnawi, 2011; Awda, 2012; Mansour, 2005, 2018a).

The fish of the current study is considered among the medium fat fish according to the classification indicated by (Al-Aswad, 2000) depending on its fat content.

The results of the current study showed an inverse relationship between moisture content and fat content. The higher the moisture content, the lower the fat content, and vice versa, and this is consistent with the study (Awda, 2012; Al-Mhanna, 2015, Al-Baldawi, 2019).

As for the ash, it represents the mineral salts found in fish and meat. It contains salts represented by phosphorous, calcium, magnesium, and sodium, in addition to containing rare elements represented by iron, iodine and copper (watanabe et al., 1997; Mahdi et al., 2006; Hadjinikolova, 2008; Shaker and Muhammad, 2013), and the focus was on determining the nutritional value of *Arabibarbus grypus* in two different areas of the body represented by its calories. The calorie (energy) values are a reflection of the values of protein content and fat content in fish muscles (Bosch, 2012; Martines et al, 2017; Mansour, 2018).

The results of the current study showed that *Arabibarbus grypus* fish have high calories (energy), as it reached in *Arabibarbus grypus* fish (167.05 Kcal /g).

Table (1): shows the proportions of chemical composition in my area (R2, R1) of carp muscles

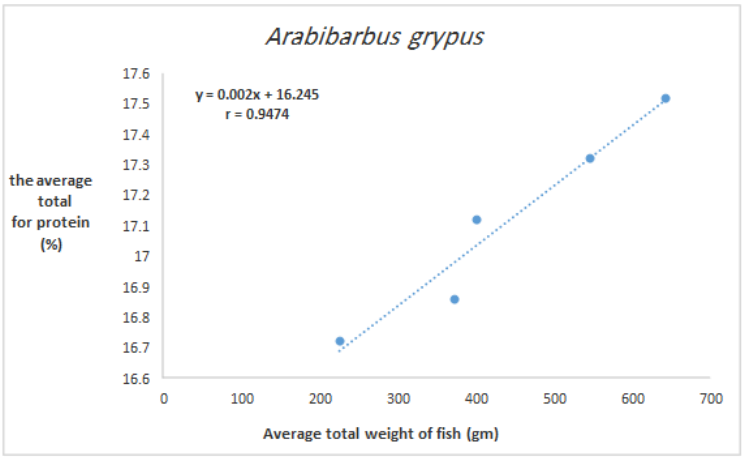
A. grypus

Total length group (mm)	number of fish	Average fish weight (g)	Chemical content rates in the (R1) region				Chemical content rates in region (R2) the			
			protein percentage %	fat percentage %	Moisture percentage %	Ash percentage %	Protein percentage %	fat percentage %	Moisture percentage %	Ash percentage %
-199 150	10	226.13 ± 1.94	16.98 ± 0.05	5.93 ± 0.03	70.96 ± 0.04	6.61 ± 0.01	16.47 ± 0.04	5.98 ± 0.05	69.72 ± 0.01	5.84 ± 0.02
-224 200	10	373.49 ± 1.73	17.21 ± 0.02	6.67 ± 0.01	69.54 ± 0.06	6.73 ± 0.05	16.52 ± 0.01	6.92 ± 0.03	69.46 ± 0.04	5.98 ± 0.05
-249 225	10	401.91 ± 1.88	17.52 ± 0.01	7.23 ± 0.05	69.02 ± 0.01	7.05 ± 0.02	16.72 ± 0.02	7.17 ± 0.04	68.89 ± 0.03	6.06 ± 0.01
-274 250	10	546.26 ± 1.63	17.81 ± 0.04	8.01 ± 0.03	68.53 ± 0.04	7.1 ± 0.03	16.83 ± 0.03	8.09 ± 0.01	67.16 ± 0.02	6.11 ± 0.04
-300 275	10	643.13 ± 1.65	18.02 ± 0.02	8.21 ± 0.04	68.02 ± 0.05	7.21 ± 0.04	17.03 ± 0.02	8.27 ± 0.03	66.01 ± 0.02	6.2 ± 0.03

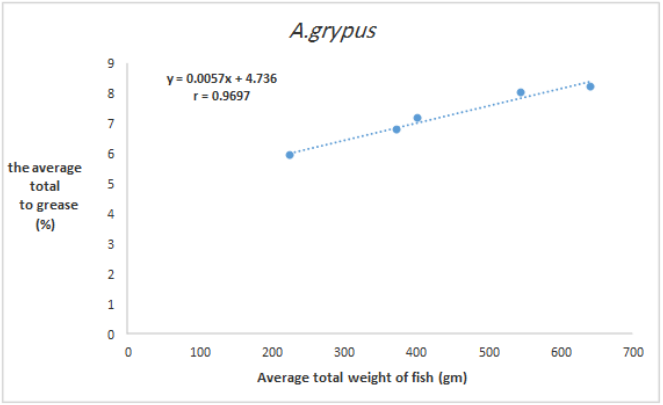
± ..... standard error

Table (3): Shows the total rate values of the front and rear areas (R1,R2) for protein, fat, moisture and ash content ratios in carp *A. grypus*

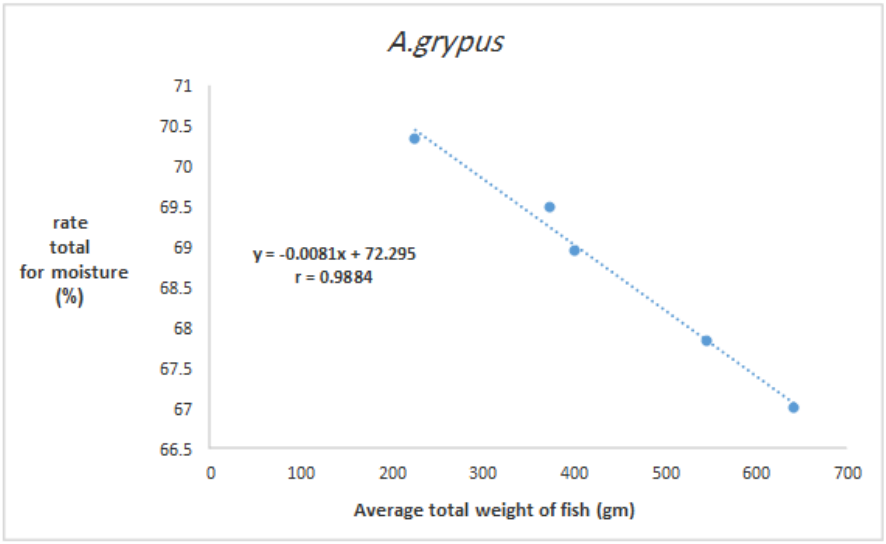
totals height	%total protein	%total fat	%total moisture	%Total Ash Rate
1	16.72	5.95	70.34	6.22
2	16.86	6.79	69.50	6.35
3	17.12	7.20	68.95	6.55
4	17.32	8.05	67.84	6.60
5	17.52	8.24	67.01	6.70



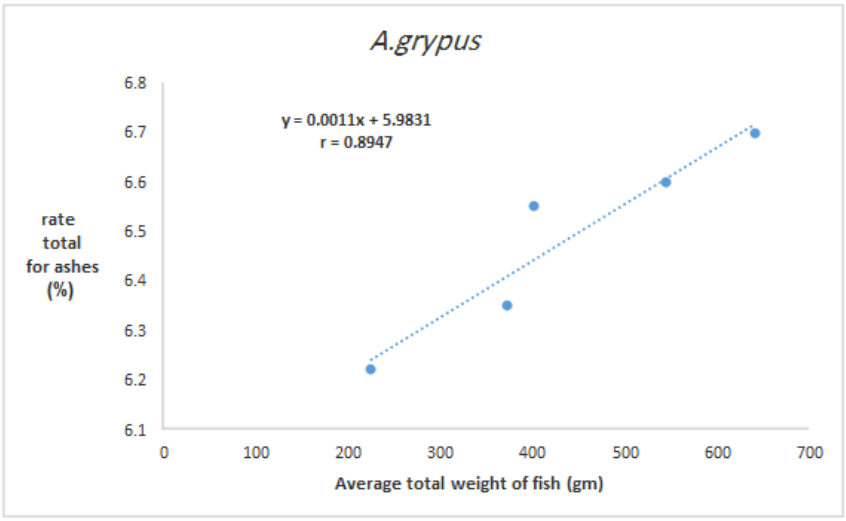
Shape (6): Shows the linear relationship between the total weight rate of fish (g) and the total rate of protein content (%) in A.grypus



Shape (8): Shows the linear relationship between the total weight rate of fish (g) and the total rate of fat content (%) in A.grypus



Shape (10): Shows the linear relationship between the total weight rate of fish (g) and the total rate of moisture content (%) in A.grypus



Shape (12): Shows the linear relationship between the total weight rate of fish (g) and the total rate of ash content (%) in A.grypus

REFERENCES

1. Henchion, M., Hayes, M., Mullen, A., Fenelon, M. and Tiwari, B. (2017). Future Protein Supply and Demand: Strategies and Factors Influencing a Sustainable Equilibrium. Foods, 6 (53): 2-21.
2. A.O.A.C. (1999). Estimation of Moisture content (%) in body muscles of selected fishes Wallago attu and Speratamystus seenhala collected from selected habitats in different seasons (reservoirs) : 90 - 104.
3. Hadjinikolova , L . (2008) . Investigations on the Chemical Composition of Carp , Cyprinus carpio (L.) Big Head Carp , Aristichthys nobilis (RICH.) and Pike , Esox lusius (L.) During Different Stages of Individual Growth . Bulgarian Journal of Agricultural Science ., 2 : 121 - 126 .
4. Bosch A C (2012) Investigation of the chemical composition and nutritional value of smoothhound shark (Mustelus mustelus) meat. M. Sc. Thesis. University of Stellenbosch: 87pp
5. shearer KD .(1994) .Factors affecting the proximate composition of cultured fishes with emphasis on salmonids.Aquaculture.119(1):63-88.
6. Martines M G, Martins D E G and Pena R S (2017) Chemical composition of different muscle zones in pirarucu (Arapaima gigas). Food Sci. Technol., Campina. 37(4), 651 - 656.

7. Mansour A J (2018) A comparative study of the chemical composition and nutritional value of muscles in different zones in body of two species of teleosts; Greenback mullet, Planiliza subviridis (Valenneciens, 1836) and abu mullet, Planilizaabu (Heckel, 1843). J. Globalphar. Technol. 10 (10), 347-352.
8. FAO. 2016, The State of World Fisheries and Aquaculture. Food and Agriculture Organization Rome, 200.
9. Tilami, S. K.; Sampels, S.; Krejsa, J.; Masilko, j. and Mraz, J. (2018). The Nutritional Value of Several Commercially Important River Fish Species from the Czech Republic. eerJ. 6. 10.7717/peerj.5729.
10. Oluwaniyi, O.O. Dosumu, O.O. Awolola, G.V. (2010). Effect of processing methods (boiling, frying and roasting) on the amino acid composition of four marine fishes commonly consumed in Nigeria. Food Chem 123:1000–1006.
11. Borkenhagen, K. (2014). A new genus and species of cyprinid fish (Actinopterygii, Cyprinidae) from the Arabian Peninsula, and its phylogenetic and zoogeographic affinities. Environment Biological Fish, 97 (10): 1179–1195.
12. Coad, B. W. (2010). Freshwater fishes of Iraq. Sofia-Moscow. 294 page.
13. Mahdi , A . A . (2006) . Effects of Starvation on the Proximate Chemical Composition of the Juveniles Bunnyi , Barbus sharpeyi . Iraq J. Aqua ., 1 : 11-16 .
14. Watanabe , T . Kiron , V ., and Satoh , S . (1997) . Trace Minerals in Fish Nutrition . Aquaculture ., 151 : 185 - 207
15. AL-Aswd, Majid Yishir. (2000). Meat Science and Technology, Third Edition, Book House for Printing and Publishing, Mosul University: 466 pages.
16. Oda, Yasser Wasfi. (2012). An anatomical study comparing the appearance and tissue aspects of the gums and muscles of some local fish. Master's thesis, Faculty of Education, Basra University: 82 pages.
17. Al-Shati, Sabah, what is up with you, you are a nice one (2006). A technological, ecological and microbiological study on smoking, pickles and drying up four species of sea fish common in Basra. PhD Thesis, College of Agriculture, Basra University: 221 pages.
18. Al-Muhanna, Mohammed Wissam Haidar Hassan (2015). *Aspius vorax*, *Liza abu*.phd thesis, University of Karbala .134 pages.
19. Al-Baldawi, Ali Naseer. (2019) . Study of anatomical and chemical comparison of structural muscles in two types of tilapia bony fish *coptodon zillii* and *luciobarbus xanthopterus* in the Indian River. Master's thesis, Faculty of Education for Pure Sciences, University of Karbala.105 pages.
20. Al-Hasnaoui, Salam Najm Abd. (2011). A tissue study of the muscles and muscles of three types of carp family fish College of Science, University of Al-Qadisiyah:81pages.
21. Naif, Shamran 2005 demanded some reproductive production qualities for herds of fish hatchers in Babylon province. Master's thesis, Musayyib Technical College: 6 - 1 .