Acta Scientific MICROBIOLOGY (ISSN: 2581-3226)

Volume 6 Issue 12 December 2023

Research Article

Comparative Study of Biochemical Composition of the Four Commercially Important Fishes (*Pampus argenteus, Rastrelliger kanagurta, Sillago sihama* and *Sparidentex hasta*) Collected from Karachi Fish Harbor, Pakistan

Moniba Shafaat and Rashida Qari*

Institute of Marine Science, University of Karachi, Pakistan

***Corresponding Author:** Rashida Qari, Professor, Institute of Marine Science, University of Karachi, Pakistan.

DOI: 10.31080/ASMI.2023.06.1322

Received: November 02, 2023

Published: November 27, 2023

Abstract

This study compares the biochemical composition of four edible commercial fish species (*Rastrelliger kanagurta, Pampus argenteus, Sillago sihama* and *Sparidentex hasta*). All samples were collected from Fish harbour Karachi during the period of November 2016 to May 2017. The results revealed variation were found in total carbohydrate 28-40%, total protein 9-21%, total lipid 4-7%, total ash 31– 44%, moisture 1-3.2% and water 14.26- 46.59%. The high protein content was found in the specie of *Sillago sihama* and high lipid content in *Sparidentex hasta* and *Pampus argenteus*. The carbohydrate content was high in *Rastrelliger kanagurta* and *Pampus argenteus*. The result show that positive significant correlation was found in between biochemical constituents among fishes investigated. In all studied fishes high protein and carbohydrate results indicates that they are good source of energy, can used as body building block and for repairing tissues.

Keywords: Fishes; Protein; Lipid; Carbohydrate and Karachi Fish Harbour

Introduction

Karachi Fish Harbour is the major harbour of Pakistan, located in Karachi, Sindh. Over 90% of the Pakistani fish and seafood catch and exports pass through this harbour. A substantial quantity of fish is consumed locally. Small pelagic and by-catch of trawl fishing is being used for production of fish meal. Remaining balance is exported in salted dried and frozen form. Fishing in Pakistan is a main cause of export making and plays a vital role to develop national economy. The coastline of Pakistan with full of fish species has not been used for sponsoring fish trade locally and globally [1]. Asian countries population like Bangladesh and Cambodia has been taking 75% of regular protein by fish [2]. Fish has eight required amino acids, e.g. the sulphur-containing lysine, methionine, cysteine and a worthy proportion of protein from 15% to 28%, on healthy-weight origin [3]. Fish mainly assimilates protein in its muscles. FAO [4] agreed about the regular configuration of eatable share of fish that revealed dissimilar species hold by the identical family influenced distinct chemical composition. For example, common carp *Caprinus caprio* (Cyprinidae) flesh contains 17.5% protein, 4.7% fats and 117 kcal of energy. Similar species shows the different muscles composition during different season of year.

Pakistan has fishing trade as the major foundation of earnings [1,5,6]. Nazir., *et al.* [1] have studied the fisheries economy of Pakistan, plan of actions for fisheries management and correlate with seafood market economics which directly highlights fishing efforts linked with economic efficiency and national income in Pakistan. People turn out to be sensible regarding wellbeing benefits of low exploited fish from the past few years [7]. Bearing in mind these problems and to facilitate increased consumption of edible fish are utilizing in development of value added products such as canned sardine and fish products, fish pickle and fish protein concentrates or isolates for use as protein supplement.

In the period of 2001 world fish consumption was increased from 9.0-16.3 kg but in Pakistan it was from 1.0 kg to 2.3 kg at the same time [6]. However, there is no abundant information available on the biochemical and chemical composition of local fish. Hence present investigation on the biochemical component of four edible local fishes: *Sillago sihama*, *Sparidentex hasta*, *Rastrelliger kanagurta* and *Pampus argenteus* was taken for evaluation of their nutritional quality.

Materials and Methods

The sampling was done during three months November 2016, February and May 2017 from the commercial catch of main landing site.

Collection Site

The sampling area of the present work was the Karachi Fish Harbour. Harbour is located at Karachi port, Ibrahim Hyderi and it is being operated by Provincial government of Sindh. It has big population, approximately 150,000 people, most of whom earn a living primarily through fishing. It is the best place to buy fish in Karachi. Karachi Fish Harbour handles about 90% fish and sea food catch in Pakistan and 95% fish and sea food exports from Pakistan.

Identification

For identification the fish species were sorted out on the basis of FAO (6) identification guide book. Total four species of fishes (*Pampus argenteus, Rastrelliger kanagurta, Sillago sihama* and *Sparidentex hasta*) have been identified belonging to four families: Stromateidae, Scombridae, Sillaginidae and Sparidae (Plate 1-4).

Plate 1: *Pampus argenteus* (Euphrasen, 1788).

Plate 2: *Rastrelliger kanagurta* (Cuvier, 1817).

Plate 3: *Sillago sihama* (Forsskal, 1775).

Plate 4: *Sparidentex hasta* (Valentines, 1830).

Biochemical analysis

For the biochemical analysis following methods have used. The carbohydrate was estimated by using phenol sulphuric acid method [8]. The concentration of protein was determined by Lowry's method [9]. The total lipid was extracted by Soxhlet extraction method [10]. Ash and moisture content both were determined by the standard method of A.O.A.C [11].

Results and Discussion

Measurable variations in biochemical composition (carbohydrate protein, lipid, ash etc.) of total four species of fishes belonging to different families of class Actinopterygii (*Pampus argenteus*, *Rastrelliger kanagurta*, *Sillago siharna*, *Sparidentex hasta*) were observed (Table 1). *Pampus argenteus* is inshore specie, usually in schools over muddy bottoms, associated with other fishes like *Nemipterus* and *Leiognathus* [4]. In *Pampus argenteus* the range of water content was 27.27-46.66% with the mean value of 39.79% and the range of carbohydrate was 36-44% with the mean value of 40% (Figure 1). The range of protein was 17-21% with the mean value of 19% and the range of ash was 29-33% with the mean value of 31% (Figure 2). The range of lipid was 5-9% with the mean value of 7% and the content of moisture was 1% (Figure 3).

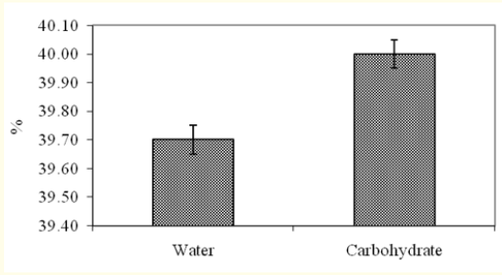

Figure 1: Variation in average content of water and carbohydrate of *Pampus argenteus.*

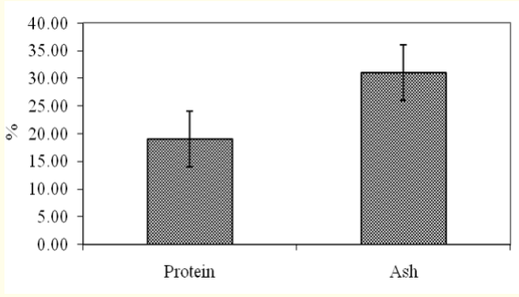

Figure 2: Variation in average content of protein and ash of *Pampus argenteus.*

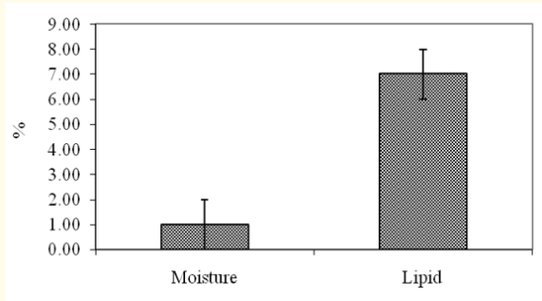

Figure 3: Variation in average content of moisture and lipid of *Pampus argenteus.*

Rastrelliger kanagurta belongs to the family Scombridae, commonly known as Indian mackerel. It is found in shallow coastal water. Adults are found in coastal bays, harbours deep lagoons and turbid water rich in plankton [4]. The range of water content was 43.78-45 .91% with the mean value of 44.84% and the range of carbohydrate was 38-44% with the mean value of 40% (Figure 4).The range of protein was 14-24% with the mean value of 20% and the range of ash was 29-34% with the mean value of 31% (Figure 5). The range of lipid was 3-5% with the mean value of 4% and the range of moisture was 2.9-3.4% with the mean value of 3.2% (Figure 6).

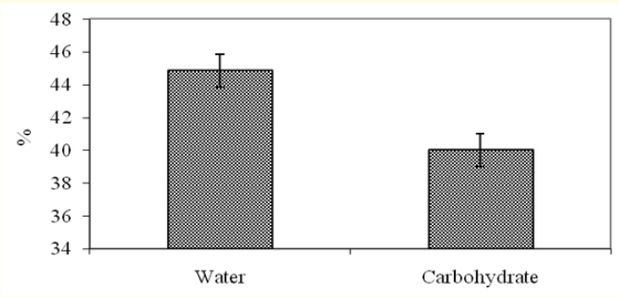

Figure 4: Variation in average content of water and carbohydrate of *Rastrelliger kanagurta*.

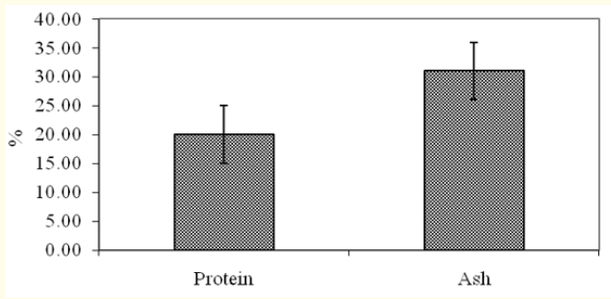

Figure 5: Variation in average content of protein and ash of *Rastrelliger kanagurta*.

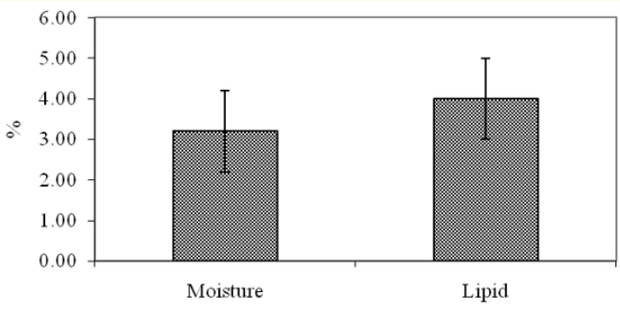

Figure 6: Variation in average content of moisture and lipid of *Rastrelliger kanagurta*.

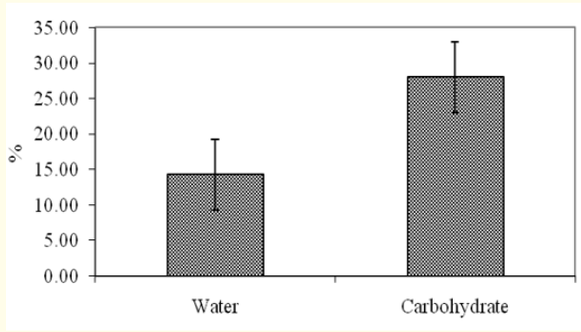

Figure 7: Variation in average content of water and carbohydrate of *Sillago sihama.*

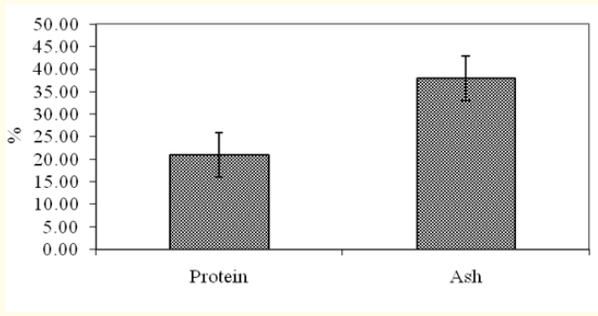

Figure 8: Variation in average content of protein and ash of *Sillago sihama.*

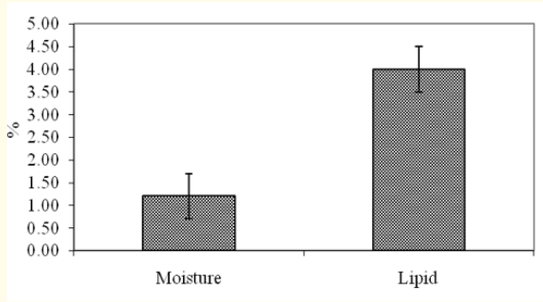

Figure 9: Variation in average content of moisture and lipid of *Sillago sihama.*

Sillago sihama belongs to the family Sillaginidae and commonly known as Silver Sillago. It inhabits shallow sandy bottoms of shores and bays; also in creeks and estuaries. It feeds on small invertebrates. The range of water content was 11.76-17.14% with the mean value of 14.26%%and the range of carbohydrate was 26-31% with the mean value of 28% (Figure 7). The range of protein was 19-24% with the mean value of 21% and the range of ash was 36-40% with the mean value of 38% (Figure 8). The range of lipid was 3-5% with the mean value of 4% and the range of moisture was 1.1-1.3% with the mean value of 1.2% (Figure 9).

Sparidentex hasta belongs to the family Sparidae and commonly known as Sea bream. It is found in shallow coastal waters to moderate depths. They are carnivorous. The range of water content was 44.21-50% with the mean value of 46.59% and the range of carbohydrate was 28-38% with the mean value of 32% (Figure 10). The range of protein was 7-11% with the mean value of 9% and the range of ash was 42-46% with the mean value of 44% (Figure 11). The range of lipid was 4-9% with the mean value of 7% and the range of moisture was 2.6-3.5% with the mean value of 3.1% (Figure 12).

There was significant positive correlation observed in between fresh weight and dry weight ($r^2 = 0.948$), water content and fresh weight ($r^2 = 0.559$), water content and dry weight ($r^2 = 0.789$), carbohydrate and water content ($r^2 = 0.614$), whereas significant negative correlation observed in between ash and protein ($r^2 = -0.601$) (Figures 13-17). It is noted also that that there was positive signifi-

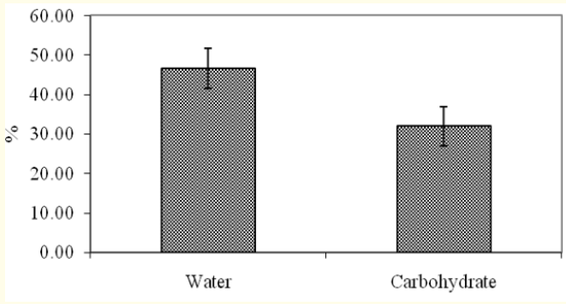

Figure 10: Variation in average content of water and carbohydrate of *Sparidentex hasta.*

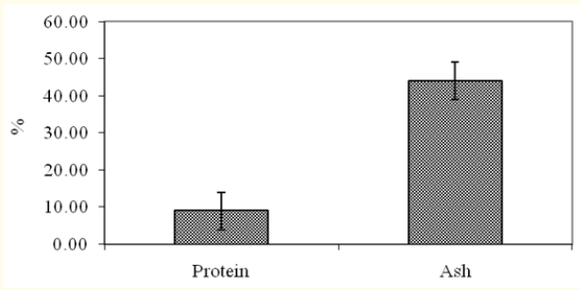

Figure 11: Variation in average content of protein and ash of *Sparidentex hasta.*

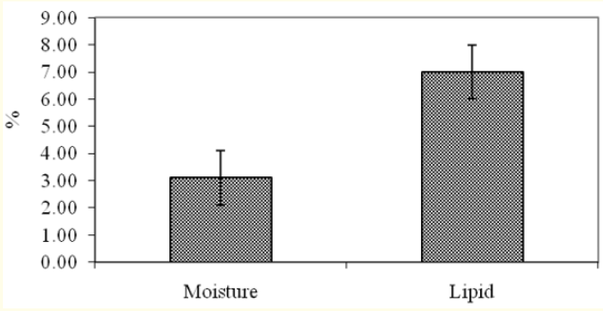

Figure 12: Variation in average content of moisture and lipid of *Sparidentex hasta.*

cant relationship found in between biochemical composition of all studied species such as in between *Pampus argenteus* and *Rastrelliger kanagurta* (r^2 = 0.970), *Pampus argenteus* and *Sillago sihama* (r^2 = 0.903), *Pampus argenteus* and *Sparidentex hasta* (r^2 = 0.839), *Rastrelliger kanagurta* and *Sillago sihama* (r^2 = 0.890), *Rastrelliger kanagurta* and *Sparidentex hasta* (r^2 = 0.845) and *Sillago sihama* and *Sparidentex hasta* (r^2 = 0.910) (Figures 18-23).

The specie *Sillago sihama* showed high protein content (21%), *Pampus argenteus and Sparidentex hasta* have high lipid content (7%), *Rastrelliger kanagurta* and *Pampus argenteus* have high carbohydrate content (40%) and *Sparidentex hasta* has high ash content (44%). The high ash content indicated the high mineral content in all studied species of fishes. In all studied fishes high protein and carbohydrate results indicates that they are good source of energy, can used as body building block and for repairing tissues.

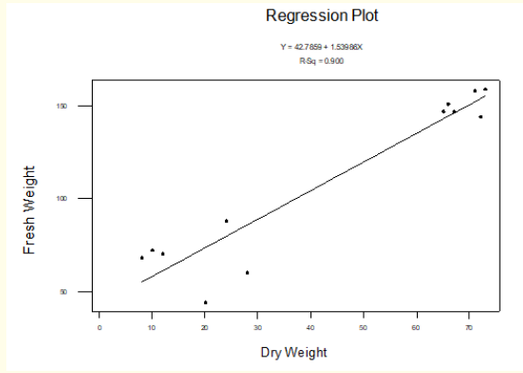

Figure 13: Correlation in between fresh weight and dry weight.

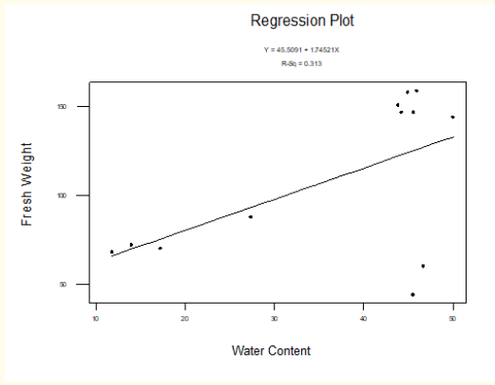

Figure 14: Correlation in between fresh weight and water content.

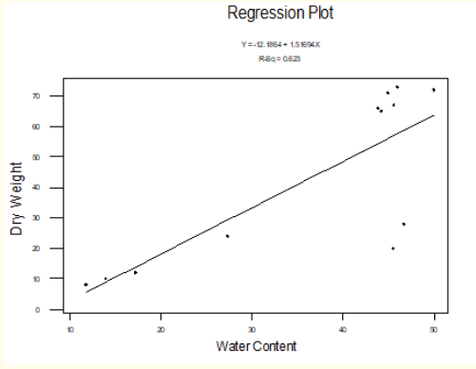

Figure 15: Correlation in between dry weight and water content.

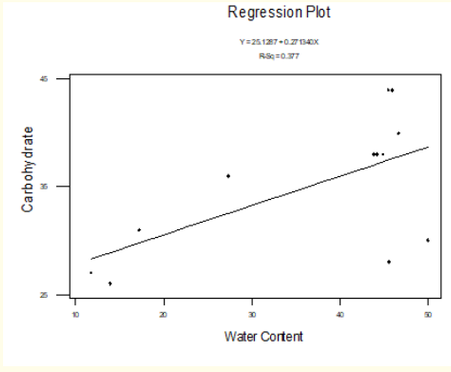

Figure 16: Correlation in between carbohydrate and water content.

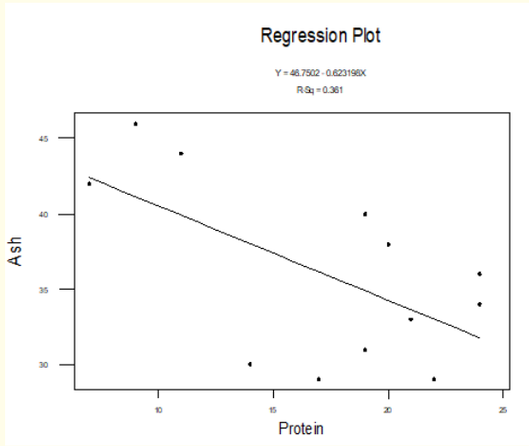

Figure 17: Correlation in between ash and protein.

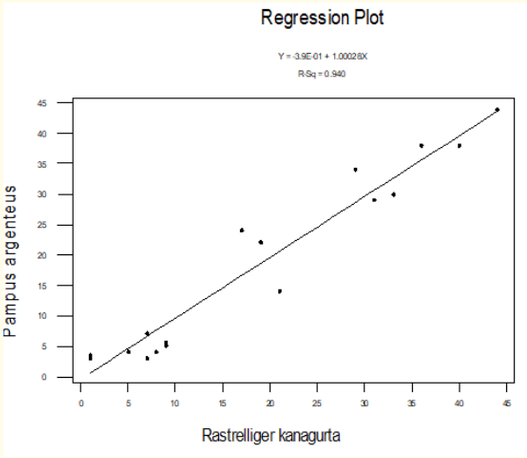

Figure 18: Correlation in between biochemical composition of *Pampus argenteus* and *Rastrelliger kanagurta.*

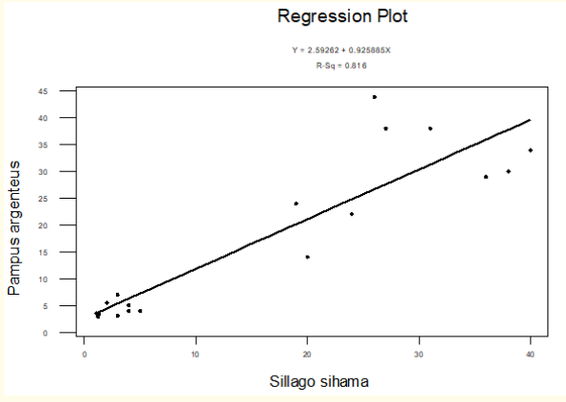

Figure 19: Correlation in between biochemical composition of *Pampus argenteus* and *Sillago sihama.*

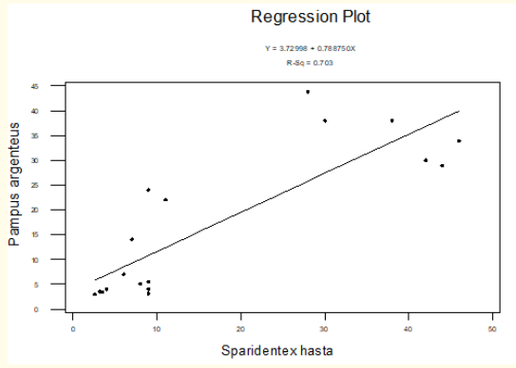

Figure 20: Correlation in between biochemical composition of *Pampus argenteus* and *Sparidentex hasta.*

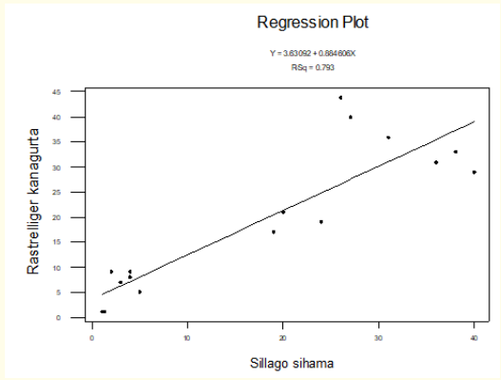

Figure 21: Correlation in between biochemical composition of *Rastrelliger kanagurta* and *Sillago sihama.*

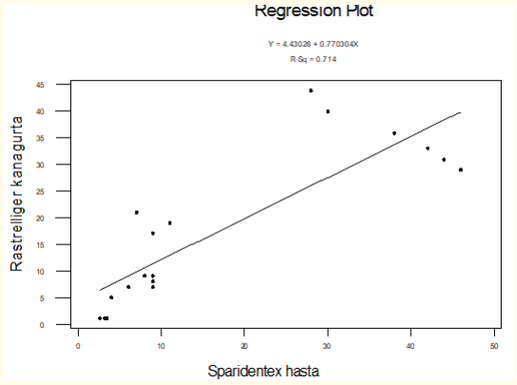

Figure 22: Correlation in between biochemical composition of *Rastrelliger kanagurta* and *Sparidentex hasta*.

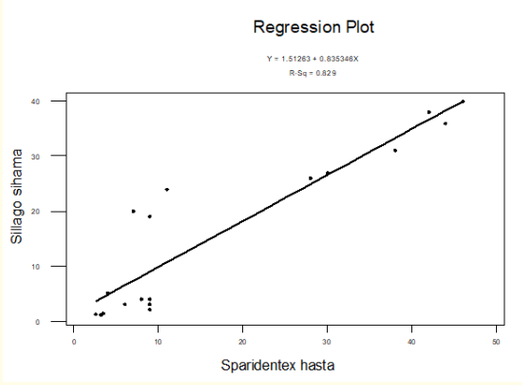

Figure 23: Correlation in between biochemical composition of *Sillago sihama* and *Sparidentex hasta.*

S. NO	Kingdom	Phylum	Class	Order	Family	Genus	Specie	Local name
1	Animalia	Chordata	Actinopterygii	Perciformes	Stromateidae	*Pampus*	*Pampus argenteus*	Sufaid-poplet
2	_	_	Actinopterygii	Perciformes	Scombridae	*Rastrelliger*	*Rastrelliger kanagurta*	Bangra
3	_	_	Actinopterygii	Perciformes	Sillaginidae	*Sillago*	*Sillago sihama*	Silver whiting
4	_	_	Actinopterygii	Perciformes	Sparidae	*Sparidentex*	*Sparidentex hasta*	Dandya

Table 1: Total species of fishes collected from Karachi Fish Harbour.

The value obtained for protein (20%) and lipid (4%) of *Rastrelliger kanagurta* in the present study were similar to the values of fishes of Mangalore coast off Karnataka, India [12] and greater than the values obtained for the same fish of Tuticorin fishing Harbour, South coast of India [13] and Sonmiani, Balochistan Coast of Pakistan [5]. In present work the biochemical composition of *Sparidentex hasta* was (protein 9%, lipid 7% and carbohydrate 32%) less than the Mozanzadeh [1] results, for the same farm sparid fishes. The fact of low lipid content (4-7%) in all studied fishes, consider they are an ideal dietetic food for man. Ash was high in all present studied fish species such as in *Sparidentex hasta* indicating high mineral content (44%).

The composition of fish include the determination of protein, lipid, minerals or ash content constitute about 96-98% of the total constituent of the fish body [16]. The 15-25% of the total protein in fishes is considering desirable protein source [17]. The present research data provide essential baseline for future studies and give an understanding in assessing the energy value of the fishes. Variation in biochemical composition was found in fishes from one species to other species and one individual to other individuals depend on season, location, habitat etc. [15]. From the present results it is concluded that all studied four fishes are good protein (9-21%) and carbohydrate (28-40%) source, considering that they can be used for different food purposes for the poor people.

Bibliography

1. Nazir K., *et al*. "A Preliminary Study on Fisheries Economy of Pakistan: Plan of Actions for Fisheries Management in Pakistan". *Canadian Journal of Basic and Applied Sciences* ©PEARL publication, CJBAS 3.1 (2015): 7-17.

2. Khandelwal S and Kurpad A. "A Vision for Nutrition Research in Asia". *Food and Nutrition Bulletin* 40.2 (2019): 133-142.

3. Huss HH. "Quality and quality changes in fresh fish". FAO Fisheries Technical Paper No. 348. FAO, Rome (1995): 348.

4. FAO. "Species identification sheets for fishery purposes". Field Guid Commercial marine and brackish water species of Pakistan, Rome (1985).

5. Qari R., *et al*. "Biochemical Composition of Three Commercially Important Fishes (Liza vaigiensis, Rastrelliger kanagurta and Scomberoides tol) Collected from Sonmiani, Balochistan Coast of Pakistan". *International Journal of Marine Science* 7.39 (2017): 380-385.

6. FAO. "The State of World Fisheries and Aquaculture Opportunities and challenges, Rome" (2014).

7. Munshi AB., *et al*. "Seasonal variation in biochemical composition of Sardines and Mullet from Pakistani Waters". *Journal of the Chemical Society Of Pakistan* 27.2 (2005): 190-193.

8. Dubios M., *et al*. "Colorimetric method for determination of sugars". *Analytical Chemistry* 28 (1956): 350.

9. Lowry O H., *et al*. *Journal of Biological Chemistry* 193 (1951): 265.

10. Folch J., *et al*. "A simplest method for the isolation and purification of total lipids from animal tissues". *JBC* 226 (1957): 497-509.

11. A.O.A.C. "Official methods of analysis". 15th edition, Association Official Analytical Chemists. Arlington, Virginia. (1990): 684.

12. Naik J and Raju CV. "Quality Changes during Ice Storage of Fishes Indian Mackerel (Rastrelliger Kanagurta) and Pink Perch (Nemipterus Japonicus) During Summer Season". *International Journal of Science and Technoledge* 3.6 (2015): 1-5.

13. Palani Kumar M., *et al*. "Proximate and major mineral composition of 23 medium sized marine fin fishes landed in the Thoothukudi Coast of India". *Nutrition and Food Sciences* 4 (2014): 259.

14. Mozanzadeh M T., *et al*. "Macronutrient Requirements of Silvery-Black Porgy (Sparidentex hasta): A Comparison with Other Farmed Sparid Species". *Fishes* 2 (2017): 5 24.

15. Deka BK., *et al*. "Seasonal variation of Protein and essential amino acid contents in Labeo gonius from lotic and lentic water bodies". *World Journal of Life and Lentic Water Bodies* 2.2 (2012): 71.

16. Ahmed I., *et al*. "Muscle proximate composition of various food fish species and their nutritional significance: A review". *Journal of Animal Physiology and Animal Nutrition* 106.3 (2022): 690-719.

17. Ryu B., *et al*. "Muscle Protein Hydrolysates and Amino Acid Composition in Fish". *Marine Drugs* 19.7 (2021): 377.