
Research Paper / Makale

Seasonal Variation of Nutrient Composition of Chub (*Squalius* sp.) at Çiftekavak Stream in Rize, Turkey

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Abstract: In this study, seasonal variation of nutrient composition of chub that sampling survey was carried out between April 2013-March 2014 (*Squalius* sp.) at Çiftekavak stream in Rize, Turkey was investigated. It was used chub fishes whose mean of total length 16.68±1.65 cm and mean weight 68.33±29.49 g. pH, water activity (a_w), colour, crude ash, crude protein, crude fat analysis was examine to determine of variation of nutrient composition. Winter, summer, spring, autumn data was evaluated. Max value of % crude protein was observed in summer as 19.49 %. When looked at the % crude fat data, min value was detected in winter as 2.45 %. In addition of these, there are statically significant variations as seasonal resulted from other analysis.

Keywords: Chub, seasonal, nutrient composition, *Squalius* sp., Çiftekavak (Rize).

1. Introduction

Turkey is surrounded by sea on three sides. As well as it has quite large potential for natural lakes and streams, also it is extremely rich in terms of variety of fish [1]. The developed countries are emphasized great significance on the fish and seafood. Freshwater and marine fish have particularly important roles in human nutrition [2]. The nutritional composition of fishery product is depending on various factors such as seasons, ambient temperature, species, gender, size, age and maturity status [3]. The fish's body contains usually 70-80% water, 20-30% protein, 2-12% lipids and carbohydrates in trace amounts [4]. However, meat yield and chemical composition are various according to fish species. Knowing this difference, it is important for feeding and in terms of economically preferred of concerned species. Also, there are a lot of studies on meat yield and chemical composition of more fish species living in freshwater [5].

Cyprinidae family which has number of species distributed intensely in inland waters of our country and were completely covered in Asia, Europe and Africa. Although this family represented with nearly 1500 species over the world, 30 genera and 70 species live in Turkey [6]. The chub belongs to the family Cyprinidae has a wide spread area all of Europe, the Black Sea, the Caspian Sea and the Azov Sea Basins, the Caucasus and Anatolia [7]. The most of the studies about chub has an important role in human nutrition is related to the determination of external morphological features, contents of digestive system and age estimates from scales [3].

The aim of this study, determination of seasonal variation of nutrient composition of chub that sampling survey was carried out between April 2013-March 2014 (*Squalius* sp.) at Çiftekavak Stream.

2. Material and Methods

The sampled 150 chubs by electroshock method (Fig. 2) between April 2013-March 2014 period from Çiftekavak Stream (Fig. 1) were used as the material. In this study is seasonally performed in an annual period, fish samples were prepared for analysis by bringing in according to procedures to Recep Tayyip Erdoğan University of the Laboratories of Fish Processing Technology Department.

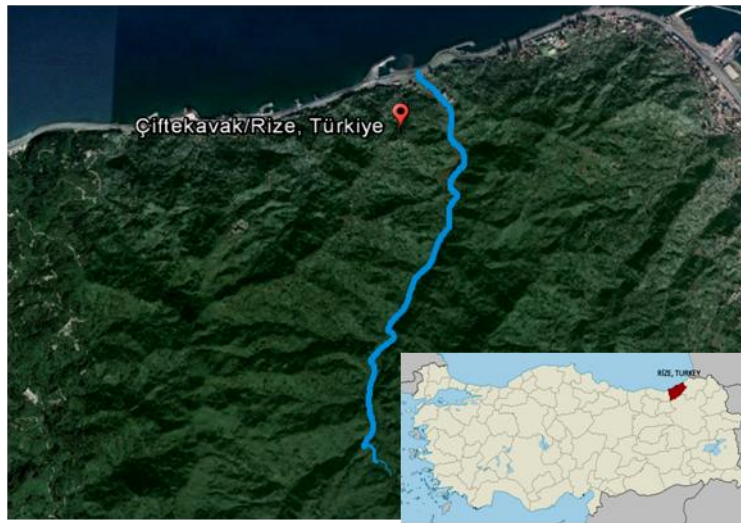


Figure 1. Sampling Area



Figure 2. Catching of fish by electro-shock method in sampling point

Measurements of fish were taken with digital calipers (0.1 mm accuracy) and electronic scales (0,001 g accuracy). In this study, average length and weight of the chubs were 16.68 ± 1.65 cm and 68.33 ± 29.49 g, respectively.

The chub is a member of the carp family. The caudal fin of chub has slightly indented and partially rounded lobes. The body color is dark on back and light on lateral. The chubs have curve shaped back and big stamps. The chubs can available weights of 4 kg and length of 35-40 cm [3].

Taxonomic position of *Barbus sp.*

Kingdom: Animalia
Phylum: Chordata
Subphylum: Vertebrata
Superclass: Gnathostomata
Superclass: Pisces
Class: Actinopterygii
Order: Cypriformes
Family: Cyprinidae
Genus: *Squalius*
Species: *Squalius sp.* (Heckel, 1847)



Figure 3. General body shape of *Squalius sp.* (Original)

The moisture was determined according to Norwitz [8] method in which the obtained 5 g sample reach the constant weighing in a 105 °C drying oven. The crude fat content was determined according to soxhlet method by using petroleum ether (Velp SER 148/6, Milano, Italy). Crude protein was determined to Norwitz [8] by using kjehdahl method and inorganic matter (crude ash) was determined to Norwitz [8]. Water activity (a_w) values of samples were determined by Aqualab 4 TE device. The pH values of fish were measured on a pH meter (Hanna, HI 3220) [9]. Color measurements were made by Konica Minolta CR 14 devices using homogenized samples. Statistical analysis; the standard deviation \pm average (n:2-3) of the parallels of datas obtained from the study was determined. The study datas were treated by the least significant difference (LSD) test of SPSS 15.0, and the significance was defined at $p < 0.05$ [10].

3. Result and Discussion

The seasonal crude protein%, crude fat%, dry matter%, ash%, a_w , pH and color values of *Squalius sp.* are given in Table 1.

Table 1. The Average chemical compositions as seasons of chubs

<i>Analysis/Seasons</i>	Spring	Summer	Autumn	Winter	
% Crude protein	17.70±0.66 ^a	19.49±2.78 ^a	19.03±2.64 ^a	19.35±2.96 ^a	
% Crude fat	3.07±0.60 ^a	2.53±1.25 ^a	2.66±1.36 ^a	2.45±0.01 ^a	
% Dry matter	22.40±0.26 ^a	21.04±1.39 ^a	22.17±2.19 ^a	23.34±0.83 ^a	
% Crude ash	1.59±0.10 ^a	1.43±0.37 ^a	1.32±0.03 ^a	1.88±0.44 ^a	
a _w	0.9960±0.01 ^a	0.9962±0.01 ^a	0.9941±0.01 ^a	0.9963±0.01 ^a	
pH	6.38±0.13 ^a	6.43±0.09 ^a	6.49±0.04 ^a	6.41±0.04 ^a	
Colour	L*	38.3±3.25 ^a	35.1±0.42 ^{ab}	32.95±1.41 ^b	36.6±0.28 ^{ab}
	+a*	5.1±0.85 ^a	3.9±1.20 ^a	4.1±0.01 ^a	5.5±2.55 ^a
	+b*	7.9±0.14 ^a	6.2±0.14 ^a	7.1±0.71 ^a	7.95±0.64 ^a

“a, b” Values in the same line followed by different letter are significantly different (p<0.05)

As a result of the analyses, protein values were determined max 19.49% in summer and min 17.70±0.66 % in spring (p>0.05). % crude fat values in spring, summer, autumn and winter were found as 3.07%, 2.53%, 2.66% and 2.45% (p>0.05). % dry matter contents were detected between 21.04% and 23.34% values (p>0.05). As shown in the Table 1, % crude ash values were found min 1.32% in autumn and max 1.88% in winter, and the difference between the seasons were not considered as significant (p>0.05). No significant differences were detected among seasons in terms of a_w values. (p<0.05) and the a_w values were determined 0.9960 in spring, 0.9962 in summer, 0.9941 in autumn and 0.9963 in winter. pH were found as max 6.49 in autumn and min 6.38 in spring. In terms of seasons no significant difference was found in the statistical analyses (p>0.05).

According to color analyses, the min-max values were found in autumn (32.95) and in spring (38.3) for L* (lightness), in summer (3.9) and in winter (5.5) for +a* (redness(+)) and greens(-)) and in summer (6.2) and in winter (7.95) for +b* (yellowness(+)) and blueness(-)). In results of statistical analyses were determined significant differences (p<0.05) between spring and autumn for L* values and no significant differences (p>0.05) for +a* and +b* values.

It is thought that shown changes as depend on species, sex, seasons and region of the differences among our data with other study data. Karaton ve İnanlı [1] examined the effect of seasonal change on the meat yield and proximate composition of chub (*Squalius cephalus*) and they reported that seasonal dry matter, ash, fat, protein, a_w values of chub stated 35.6%, 1.24%, 14.03%, 19.93%, 0.953% in autumn, 26.65%, 1.53%, 14.23%, 20.13%, 0.951 in winter, 34.01%, 1.24%, 12.76%, 17.85%, 0.952 in spring, 34.51%, 1.15%, 15.38%, 17.01%, 0.954 in summer, respectively. This results showed differences from our datas (except crude protein and a_w values).

Berik and Kahraman [11] reported that crude protein, crude fat, dry matter and crude ash values of mullet fish were found 15.97%, 2.43%, 22.55% and 1.11%, respectively. These crude protein, crude fat, and crude ash values datas were found lower than our study datas except for dry matter.

In another study, seasonal variation and meat composition of bleak (*Alburnus orontis*, Sauvage 1882) were investigated. The crude protein, dry matter, crude fat and crude ash values in this study were determined as 16.57%, 30.79%, 5.41%, 4.25% in spring, 19.53%, 57.37%, 1.26%, 4.62% in summer, 18.20%, 42.63%, 3.43%, 4.56% in autumn and 14.93%, 14.57%, 6.67%, 6.37% in winter, respectively [12]. According to season, the biochemical values showed differences from ours.

In a study entitled “Chemical Composition and Meat Yield of Vimba (*Vimba vimba tenella* (Nordmann, 1840)) in Karacaören I Dam Lake” were demonstrated that 15.30% crude protein, 2.41% crude fat, 22.04% dry matter and 1.28% crude ash [13].

Arslan [14] reported that 18.02%, 18.16%, 17.59%, 17.46% crude protein, 2.29%, 3.24%, 1.77%, 2.33% crude fat, 21.42%, 22.33%, 21.46%, 20.65% dry matter and 1.11%, 0.92%, 0.88%, 0.84% crude ash for spring, summer, autumn and winter, respectively. This study is similar with our datas except for a_w which lower than ours.

4. Conclusion

In this study, seasonal crude protein, crude fat, crude ash, dry matter, a_w and color (L,a,b) of chubs were determined. Significant differences weren't observed among the seasons except L values. The lowest protein contents were found in the spring which is reproduction period of chub. The chub can be evaluated as an important nutrient source for human diet in terms of high protein value.

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