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Biochemical composition and calorific value of six fresh water fish species from southern Iraqi Marshes

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Abstract

Six fresh water fish species were collected from southern Iraqi Marshes . The biochemical composition of the muscles, showed that the protein content was varied from lower value of 17.79%, in ***Alburnus mossulensis*** up to the highest value 23.37% in ***Silurus triostegus***. The fat content was ranged from 1.57% in ***Liza abu*** to 8.30%, in ***Barbus sharpeyi***. The moisture content varied from 69.64 to 79.41%, whereas the ash content ranged from 0.89 to 2.35%, Calorific value were estimated . It ranged from lower value of 91.55 Kcal /100g in ***B.sharpeyi*** up to the highest value 162.42 Kcal/100g in ***L.abu***. A posative relationship between the muscle fat and calorific value was observed.

1.Intoduction

Fish provide a good source of readily digested high quality animal protein , fat, mineral and vitamins specially vitamin A,D and E, fish play important roles in the prevention and management of many human diseases such as heart disorders, neurological diseases , mood swings and when fish is substituted for beef , the nitrogen is utilized better resulting in a decreased excretion of uric acid in the urine(Thilsted and Roos,1999 and Conquer.and Holub,2002).

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Fish protein produce a good influence on the assimilation of magnesium ,phosphorous and iron,the protein seem important roles in primitiv organisms for ionic balance and in moving up the evolutionary scale (Thilsted and Roos,1999). Fat in a quatic organisms are

associated with a variety of function reflecting special biochemical and environmental conditions, fats are the major metabolic reserve in most fish (Lovell,1989). Reports from various sources (Anon , 2001 and Conquer and Holub , 2002) noted that fish oils significantly lower blood pressure , protect against blood vessel constriction , thrombosis and heart arrhythmia.

Several biochemical composition and nutritive values and seasonol variation in the chemical composition of fish tissues associated with reproductive cycle were reported by (Yesser,1988; AL-Badri *et.al*.,1991; Jaber, 1994; Al-Dubaikel, 1996 and Al-Mhanawi, 2001).

The effects of food supply on the chemical composition and annual cycle of some fish female were studied by (Wootton , 1977 and Muhsin, 1987). Calorific value or nutritive value of some Iraqi freshwater fishes were studied by (Ali and Ali 1986 and Ali et al , 1986.) while nutritive value of some tropical fish were studied by (Yearsley et al , 2001 and Choo and Williams , 2003).

The present work is an attempt to investigate the variations in the biochemical composition in the muscle of some important fish species and their calorific value.

2.Material and Methods

Sample Collection and Preparation for Analysis

Samples were collected(n=3-5) from southern Iraqi marshes in Hor Al-Adel near Amarah city during March 2004 (Figure 1). The fish were collected by using gill net. Fish were iced in polystyrene box and transported to the laboratory. Three slices of muscles were taken from behind the pectoral fin, behind the anus and between the two afored regions. The skin and bone was removed manually. The samples were mixed and minced twice in a mincer, packed in polyethene bags and stored at –15C until analysis.

Chemical analysis

Chemical analysis was carried out according to the methods described by AOAC(1975). Protein was estimated as (Nx 6.25) by standard micro- Kjeldahls technique. Total fat by Soxhlet extraction methods using chloroform, diethylether (1:1 V/V). Moisture by 24 hour drying at 105C and Ash determined by heating in a muffle furnace at 550C for 18 hrs.

The calorific value was estimated using the Rubners coefficient Zaitsev,et.al.(1971) and Torry research station (1989) which gives the amount of heat released from oxidation of one gram of protein and one gram of fat. They equals to 4.27, 9.02, 4.11 for protein, fat and carbohydrate respectively. True calorific values of fish flesh was calculated using the coefficient of the assimilation of the flesh, it averaged 0.96 for fish protein and 0.91 for fish fat (Zaitsev,et.al. 1971).

3.Results and Discussion

Protein content

Table (1) shows variation in protein content and standard deviation (sd±) of six fish species studied.

The protein content of cyprinid fish were 18.02%, 17.45%, 20.23% and 17.79% for ***B.arbus Sharpeyi, B. Luteus,Carrassius auratus*** and ***Alburnus mossulensis*** respectively In previous studies the protein content of ***B. Sharpeyi*** were (16.01-22.8)% , 16.6% and 15.49% by Yesser (1988), Jaber (1994) and Al-Dubaikel (1996) respectively, whereas the protein content of ***B. luteus*** were (16.31-22.13)% and 17.65% by Yesser (1988) and Al-Mhnawi(2001).

The drop in protein level among cyprinidae (Barbus and Alburnus) may be attributed to the utilization of protein for gonads development and maturation during spawning in period study (March).

Data from other part of the world show similar values to these of ***Abramis brama*** and ***C. carpio*** (Steffen,1974 and Yearsley *et al*., 2001). Generally this result dissimilar to that from different nature and time such as ***S. Triostegus*** (Al-Badri *et al*., 1991).

The highest level protein of 23.37% was recorded for ***S. triostegus*** may attributed to good feeding with accumulation in nutrient in muscle and coincided with the early stage of gonadal maturation during period study (Lovell, 1989).

Fat Content

In present study, table(1) has been found that the fat content was more than 3% except in ***B. sharpeyi*** in which the fat content was 1.57% which can be considered by active fish, this may explained as high energy cost expenditure in searching for food (Winfree,1992). The highest level of 8.3% was recorded for ***L. abu*** coincided with high feeding rate(Muhsin, 1987 and Hibblen, 1998). It can be considered as oily fish. However Simpkins and Hubert (2003) found that inactive rainbow trout maintained relatively constant lipid level whereas active fish declined in lipid content.

Generally it has been found that the mean values of fat content in all species studied were quite variable to those of ***B. sharpeyi; B. luteus*** and ***S. triostegus***(Al-Khafajee, 1988; Al-Badri *et al*., 1991; Jaber, 1994 and Al-Dubaikel, 1996).

Data from other part of the world show that the fat content range (0.8 – 8)% in ***C. carpio*** with different feeding histories (Steffen, 1974). On the other hand, the fat content as high as 36% was recorded for the lake trout (Thurston *et al*., 1959). However, the fat content is one of the most variable body constituents in fish (Lovell, 1989 and Hibblen,1998).

Moisture Content

Variation in moisture content of most species studied were similar to those reported previously by Jaber(1994) and Al-Dubaikel (1996) for ***B. sharpeyi*** and Al-Mhnawi (2001)for ***B. luteus***. Low moisture content was found in ***L. abu***, and the high moisture content in ***B. sharpeyi***.

Generally there is an inverse relationship between the fat content and moisture content. The highest moisture content was observed when the fat content at its lowest level.

All factors which affect the fat cycle may also influence the moisture cycle indirectly since they considered as a toal liquid content in the

muscle (Adhikari and Abdunoor, 1967; and Yesser, 1988).

Ash content

Table(1) shows that the ash content of present study varied from 0.89% to 2.35%, the lowest ash content was found in ***B. sharpeyi*** where as the highest content was found in ***C. auratus***. It has been found that the main values of the ash content in ***B. luteus*** and ***S. triostegus*** were closely related to other studies including same species (Yesser, 1988; Al- Al-Badri *et al*., 1991 and Al- Mhnawi,2001). The ash content in ***B. sharpeyi*** was dissimilar to those reported previously by Yesser(1988), Jaber(1994) and Al-Dubaikel(1996).The ash content of 1.95% and 1.54% were for ***A. mossulensis*** and ***L. abu*** respectively. The changes in ash content are less dependent on the reproductive cycle, whereas they are rather related to the body metabolism, accumulation of minerals and feeding of fish (Yesser,1988 and Al-Mhnawi, 2001).

Calorific values

Among cyprinidae, the calorific values were similar to the highest value was found in ***C. auratus*** 123.99 kcal./100gm and the lowest in ***B. sharpeyi*** 91.55kcal./100gm. The calorific values of ***A. mossulensis*** and ***B. luteus*** were 107.72 kcal./100gm and 110.52 kcal./100gm respectively. While in ***S. triostegus*** was 147.55 kcal./100gm. Highest calorific value of all species studies was found in ***L. abu*** 162.42 kcal./100gm , However among cyprinidae the calorific values in the present study are almost similar to those (Ali *et al*. 1986) but less than Ali and Ali (1986). Figure (1) shows correlation between calorific values and fat content.

Data from other part of the world show that in many temperate regions , the calorific values were (147.46, 131.18, and 124.4, kcal/100gm in *Asian.carp, Aldricheta forsteri* and *Thunnus albecares* respectively (Yearsley *et al*., 2001 and Choo and Williams 2003).

Knowledge of the variation in biochemical composition and calorific value is one of the major aim in the establishment of fisheries and increasing the productivity of fish of a high nutritive value.

In addition, this study carry out in critical period of rehabilitation of southern Iraqi marshes.

Table(1):

The biochemical composition & calorific values of the muscles of six fish species in southern Iraqi Marshes.

Species	No. of Fish	Length average (cm)	Weight average (g)	Protein %	Fat %	Moisture %	Ash %	Calorific values (Kcal/100g)
Barbus sharpeyi	3	24.1	130.35	18.02±0.28	1.57±0.08	79.4±0.15	0.89±0.09	91.55±0.17
B. luteus	4	19.1	90.55	17.45±0.24	3.87±0.11	76.24±0.12	2.17±0.07	110.52±0.15
Carassius auratus	5	19.5	101.44	20.23±0.31	4.07±0.3	73.13±0.25	2.35±0.19	123.99±0.24
Alburnus mossulensis	3	12.3	13.6	17.79±0.08	3.38±0.25	76.57±0.13	1.95±0.16	107.72±0.19

Liza abu	4	12.6	26.7	20.13± 0.05	8.3±0.06	69.64±0.19	1.54±0.12	162.42±0.18
Silurus triostegus	3	33.2	299.35	23.37±0.19	5.25±0.41	70.36±0.38	0.92±0.26	147.55±0.35

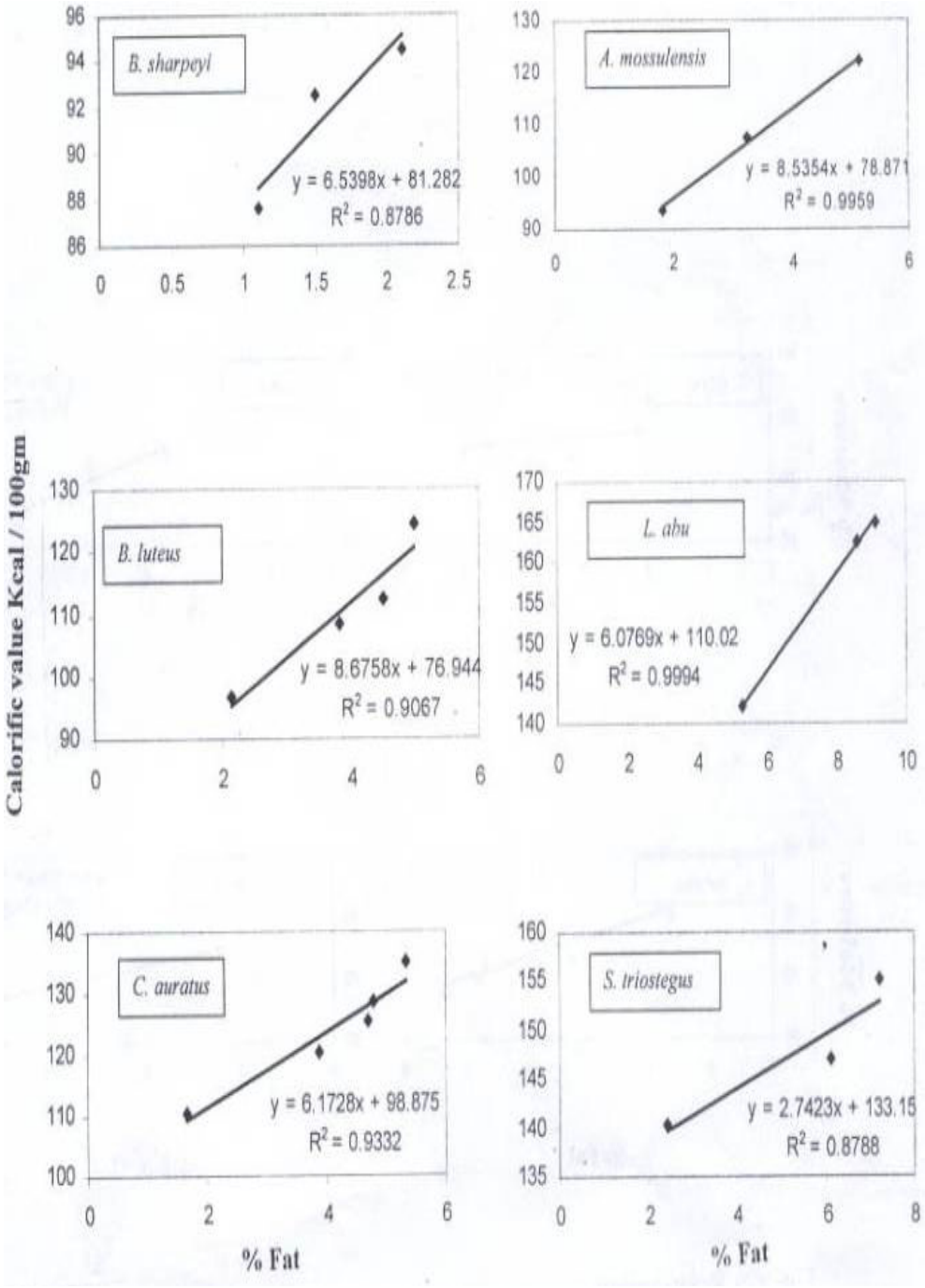

Fig. (1): Relationship between calorific values and fat content .

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