

Original Research Article

Total Lipids and Total Protein in two Mollusca Species as Environmental Biomarker of Pollution in Euphrates River, Iraq

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ABSTRACT

Keywords

Mollusca;
Total lipids;
Total Proteins;
Environmental
biomarker;
Euphrates river.

The current study was achieved by measure the total lipids and total protein concentrations in two species of Mollusca (*Unio tigridis* and *Viviparus bengalensis*), and determine the relation between the water temperature, air temperature and total concentrations of lipids and protein. The total lipid concentration in (*Unio tigridis* and *Viviparus bengalensis*) were ranged between (39.23 - 25.83%), (22.66 - 16.89 %) respectively. While the concentration of total protein were ranged between (6.59-3.89 Mg/g), (9.74-4.95 Mg/g) respectively. The results were showed a positive correlation between air temperature , water temperature and the concentration of total lipids and total protein.

Introduction

Mollusca are very important for many reasons. Apart from their commercial value for use as a human foodstuff and in the feeding of several crustaceans (Ekin and Bashan, 2010) Biochemical assays and nutrients play a vital role in physical growth, development, maintenance of normal body function of physical activity and health. The knowledge of the biochemical composition of any organisms is extremely important since the nutritive value is reflected in its biochemical contents (Periyasamy *et al.*, 2011).

Mollusca generally contain large amounts of lipids which, in comparison with proteins and carbohydrates, have high

energy contents and are thus costly in energetic terms. As lipid contents vary between species, comparisons of reproductive investments should not only include numbers and sizes (Rakshit *et al.*, 1997). Lipid composition and storage strategy in Mollusca, particularly of bivalves and gastropods, have been studied since lipids constitute a major fraction of Mollusca tissues (Voogt, 1983). Lipids are major sources of metabolic energy and essential compounds for the formation of cell and tissue membranes (Sargent, 1995), and they are important in the process of egg production and during larval development, especially embryogenesis and metamorphosis. They

also provide energy for growth during conditions of limited food supply, when carbohydrate levels are low (Pazos,1997).

Proteins are long chains of amino acids forming three dimensional structures. Proteins do play both structural and functional role of cellular level. Being an integral part of the cell membrane, intracellular and extra cellular passages are linked through it (Anilkumar and Meenakshi, 2012).Any sort of cellular metabolism occurring in body involves one or many different proteins. The proteins are among the most abundant biological macromolecules and are extremely versatile in their function and interaction during metabolism of proteins, amino acids, enzymes and co-enzymes (Harper *et al.*, 1978).The aim of the current study to determine the total concentration of lipids and proteins in the soft tissue of two species of freshwater Mollusca and assay the effect of some physico-chemical properties of water on them.

Materials and Methods

Study area

Samples were collected monthly from Euphrates River in the middle of Iraq from October 2011 to September 2012. The sample locations are shown in figure-1. The Mollusca individuals were obtained by hand collecting from hard substrata in shallow waters or from stones and rocks or from the net of the fishermen or from aquatic plants in the near shore. Soft substratum and plant material on Mollusca was removed by washing it in river water, and then put in plastic bag and when brought to laboratory, washed with tap water and Distilled water to remove any residue, The Mollusca taxa classified

according to Ahmed (1975) and stored in clean bags under freezing.

Air and water temperature

Air and water Temperature directly measurement by using mercury thermometer (0C -100 C°).

Determination of total lipids and total proteins

Total lipid was determined according to (CPFAC, 2001) assay by using Chloroform / methanol / water extraction from small samples. Protein concentration was determined in resulting pellet using the Bradford (1976) assay with blue brilliant of coomassie (G 250, Merck) as reagent and bovine serum albumin (Sigma) as standard. The reading of absorbance was done at 595 nm.

Statistical analysis

In order to study the different relationships between water temperature, airtemperature, total lipids and total proteins the correlation coefficient matrix (r) was calculated using computer program (Cononical Correspondence Analysis CCA).

Result and Discussion

Total lipids

The total lipids concentration in *Unio tigridis* were ranged between (39.23 - 25.83%), the highest values were recorded during summer and the lowest value waswere recoding during winter table (1) figure (2). While the concentration of total lipids in *Viviparus bengalensis* were ranged between (22.66 - 16.89 %), the highest values were recorded during

Figure. 1 A map of study sites

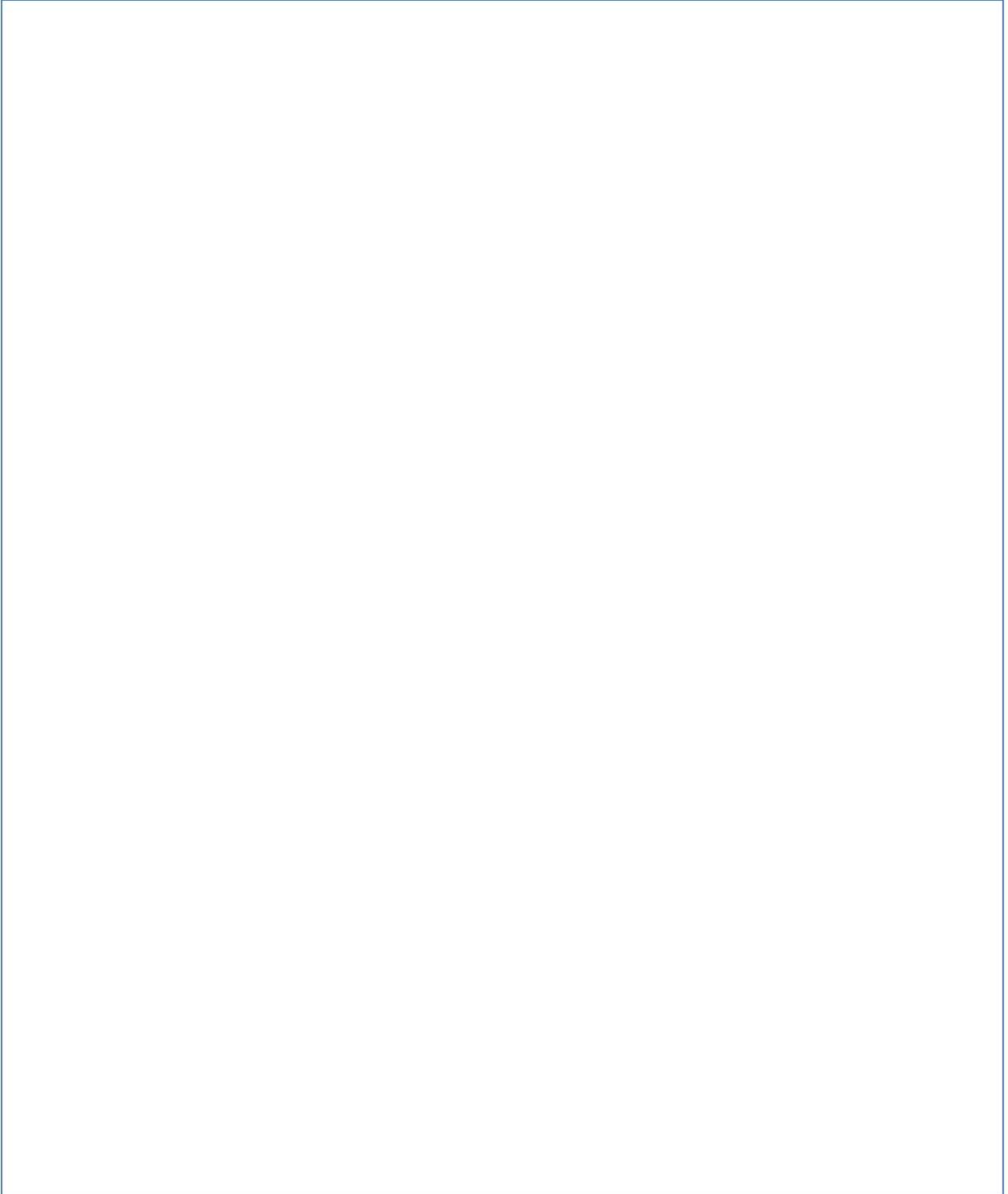


Table.1 The seasonal variation in the total concentration of lipids and protein in the soft tissue of Mollusca in Euphrates River during the period of study

Species	Lipids Concentration (%)				Proteins Concentration (Mg/g)			
	Autumn 2011	Winter 2012	Spring 2012	Summer 2012	Autumn 2011	Winter 2012	Spring 2012	Summer 2012
<i>Unio tigridis</i>	32.29	25.83	27	39.23	6.83	4.95	5.4	9.479
<i>Viviparus bengalensis</i>	19.63	16.89	19.43	22.66	5.44	3.89	4.79	6.59

Figure.2 The seasonal variation in the total concentration of lipids in *Unio tigridis* and *Viviparus bengalensis*

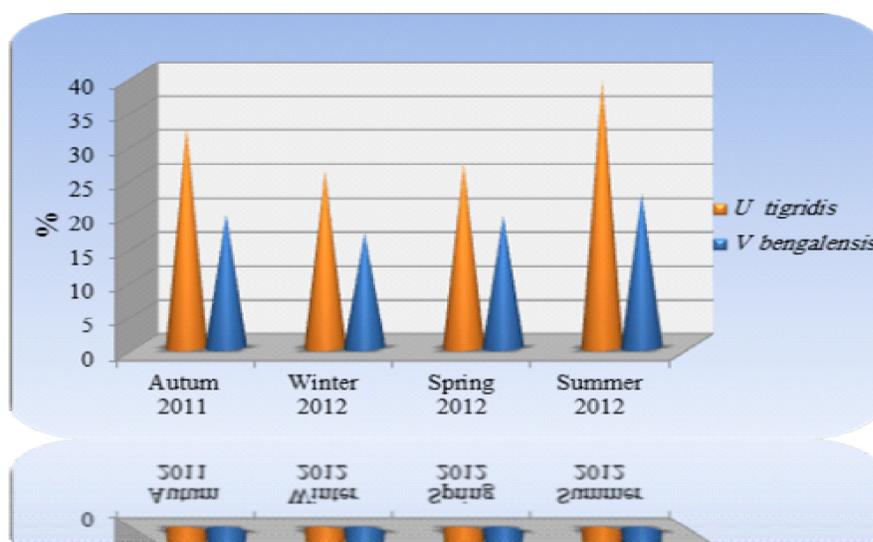


Figure.3 The seasonal variation in the total concentration of protein in *Unio tigridis* and *Viviparus*

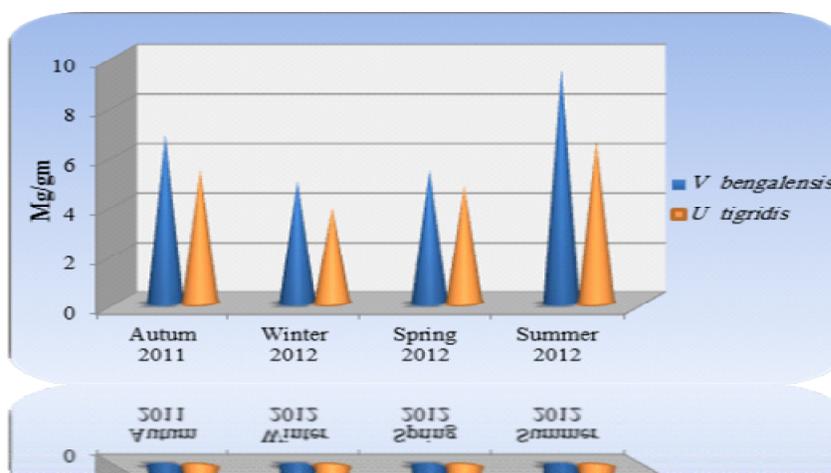


Figure.4 the correlation between water temperature, air temperature, total lipids and total protein according to Canonical Correspondence Analysis (CCA)

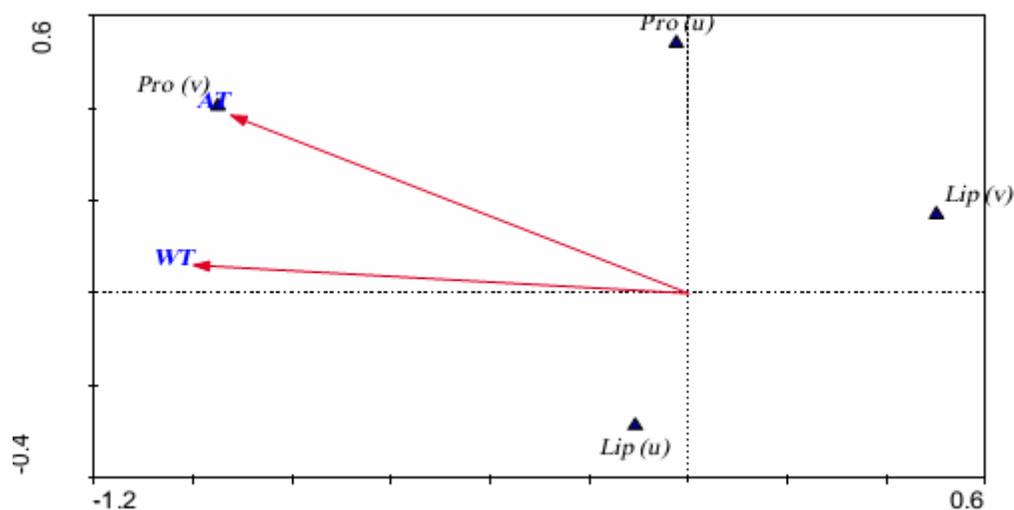


Table.2 A comparison between total lipids concentration in current study in Euphrates River with other studies in different regions

References	Concentration of total lipids	Part of body	Species	Location
Allen <i>et al.</i> , (2001)	4.41	Whole body	<i>Clayptogenapacifica</i>	Juan de Fuca Ridge-Florida-USA
Ekin <i>et al.</i> , (2011)	31,73	Selected Tissues	<i>Unio elongatulus</i>	Tigris River, Turkey
Hamdani&Soltani-Mazouni, (2011)	25.56	Gonads	<i>Donax trunculus</i>	Gulf of Annaba (Algeria)
Ekin& Bashan, (2011)	43.65	Whole body	<i>Melanopsis praemorsa</i>	from springs southeast Anatolia, Turkey
Nandurkar&Zambare, (2012)	8.917	Whole body	<i>Lamellidens corrianus</i>	India
Nandurkar&Zambare, (2012)	7.458	Whole body	<i>Parreysiacylindrica</i>	India
Present Study	31.56	Whole body	<i>Unio tigridas</i>	Euphrates River, Iraq
Present Study	19.69	Whole body	<i>Viviparus bengalensis</i>	Euphrates River, Iraq

Table.3 A comparison between total protein concentrations in current study in Euphrates River with other studies in different regions

References	Protein concentration	Part of body	Species	Location
Satyaparameshwaret al ., (2006)	162.1	Adductor muscle	<i>Lamellidens marginalis</i>	Warangal-India
Satyaparameshwaret al .,(2006)	11.4	Gill	<i>Lamellidens marginalis</i>	Warangal-India
Satyaparameshwaret al .,(2006)	89.5	Mantle	<i>Lamellidens marginalis</i>	Warangal-India
Baby, et al ., (2010)	8.966	Whole body	<i>Bellamya bengalensis</i>	Molluscs of Bangladesh
Baby, et al ., (2010)	12.357	Whole body	<i>Melania tuberculata</i>	Molluscs of Bangladesh
Baby, et al ., (2010)	6.464	Whole body	<i>Lamelhidens marginalis</i>	Molluscs of Bangladesh
Baby, et al ., (2010)	12.927	Whole body	<i>Anisus convexiusculus</i>	Molluscs of Bangladesh
Hamdani&Soltani-Mazouni, (2011)	14.6	Gonads	<i>Donax trunculus</i>	Gulf of Annaba (Algeria)
Anilkumar & Meenakshi, (2012)	59.22	Gill	<i>Lamellidens corrianus</i>	Nathsagar dam in India
Anilkumar & Meenakshi, (2012)	50.29	Gonad	<i>Lamellidens corrianus</i>	Nathsagar dam in India
Present Study	5.18	Whole body	<i>Unio tigridas</i>	Euphrates River, Iraq
Present Study	6.66	Whole body	<i>Viviparus bengalensis</i>	Euphrates River, Iraq

summer and the lowest value was were recoding during winter table (1) figure (2). The results of statistical analysis were showed significant deference in the values of total lipids in both species during the study period ($p < 0.01$, $p < 0.05$). and according.

Total protein

The concentration of total protein in the *Unio tigridis* were ranged between (6.59 Mg/g) as highest values during summer and (3.89 Mg/g) as lowest values during Correspondence Analysis (CCA), figure

winter table (1) figure (3). While the concentration of total proteins in *Viviparus bengalensis* were ranged between (9.74 Mg/g) as highest values during summer and (4.95 Mg/g) as lowest values during winter table (1) figure (3). The results of statistical analysis were showed significant deference in the values of total lipids in both species during the study period ($p < 0.01$, $p < 0.05$). The results were showed a positive correlation between air temperature, water temperature and the concentration of total protein and lipids according to Canonical (Figure 4).

The lipids and proteins composition of the mollusks can be affected by external (exogenous) factors, such as fluctuations in the environmental conditions (temperature and food availability), or by internal (endogenous) factors, such as metabolic and physiological activities (Brazao, 2003), and reciprocal relationship between the synthesis of lipids and utilization of proteins and vice versa, was reported in many Mollusca species (Reju, 1990).

Total lipids and protein were found to be lower in the winter season while higher in the summer season this confirmed by the positive correlation between air and water temperature with the concentration of total protein and lipids according to Canonical Correspondence Analysis (CCA), this may be due to Shifting of metabolic dependency from carbohydrate to other metabolites such as lipid, and protein also can be suggested during starvation in cold seasons (Ekin and Bashan, 2011).

It was reported Mollusca use the following percentage of energy dependency during starvation; 75% due to protein, 10% to carbohydrates, and 15% lipids (Bishop *et al.*, 1983). The variation in total lipids and protein concentration between species (*Unio tigridis* and *Viviparus bengalensis*) may be due to the physiological, genotype and phenotype differences. When compared the results of current study with other studies in deferent regions(table 2) we find the concentration of total lipids were high in compare with study of (Allen *et al.*, 2001) in Juan de Fuca Ridge-Florida-USA, and study of(Hamdani and Soltani-Mazouni, 2011) in Gulf of Annaba (Algeria), but the concentration of total lipids were less in compared with

study of (Nandurkar and Zambare, 2012) in India, and study of (Ekin *et al.*, 2011) in Tigris River- Turkey, and study of (Ekin and Bashan, 2011) in springs southeast Anatolia, Turkey.

When compared the concentration of total protein in the current study with other studies in different regions of world (table 3) we find the concentration of total protein in current study less than all this studies .

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