Nutritional Value of Marine Bivalve, *Donax variabilis* (Linnaeus, 1758) from Porayar Coastal area, Nagapattinam District Tamil Nadu India

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ABSTRACT

The molluscs have been given more importance, because they have both ecological and economically importance to mankind. Present work was carried out biochemical observation in the different tissues of marine clam Donax variabilis in gill, foot and muscle. The result deals with biochemical composition of common clam, Donax variabilis and the record confirmed that protein content was found to be higher in the muscles (20%), followed by carbohydrate (18%) lipid (12%) and fatty acid (18%). The results of the present study indicated that the tissue of the clam, D. variabilis was found to be a valuable food recipe for human consumption, due to high quality protein and well-balanced fatty acids.

Keywords: *Donax variabilis, Nutritional analyusis, Carbohydrate, Lipid, Fatty acid.*

INTRODUCTION

The Indian coast is blessed with number of ecosystems such as coral reefs, mangroves, lagoons, estuaries, sandy beaches and rocky shores. Among these, the coral reef and rocky shores are having rich assemblage of molluscan fauna. The molluscs are abundant in rocky shores, as it provides a better substratum and act as a feeding and breeding ground, ensuring a favorable environment for their survival. The molluscan fishery comprises an important component of the Indian sea food Industry. Although many species of the phylum mollusca are indigenous to the continent, the most important classes of commercial interest are the bivalves (oysters, clams, scallops and mussels), gastropods (conchs, whelks, abalones and periwinkles) and cephalopods (Gopalsamy Idayachandiran *et al.*, 2014).

The edible species of Marine bivalve mollusks are tasteful and it will get more importance next to fish and prawn. Marine mollusks are economically important species and it is easy to cultivate in coastal region. The marine mollusks are having leading components of bivalve fishery in aquaculture coastal area (Jones and Alagarswami, 1973) and it forms an important source of nutrition for coastal folks (Verlecar *et al*., 2006). In general, bivalves are found in abundance in seashores and estuaries and form the food of many coastal people in India. Donacids are suspension filter feeders inhabiting seawaters of tropical and subtropical areas. This wedge clam, belonging to the family Donacidae, is found around the Indian coast east (Karthikeyan *et al.,* 2009; Varadharajan *et al.,* 2010). The knowledge on biochemical composition of any edible organisms is extremely important since the nutritive value is reflected in its biochemical contents (Nagabhushanam and Mane, 1978). The demand for protein rich food is increasing, especially in developing countries, stimulating the exploration of unexploited or non-traditional resources. Molluscs are important for marine ecology and human diet, since it is an important source of nutrients. The variations in the total protein, carbohydrate, lipid, and fatty acid content of the mature and immature green mussel, *Perna viridis* from the Ennore estuary of Madras coast. Consumption of marine molluscs provides an inexpensive source of protein with a high biological value, essential minerals and vitamins. Navarro *et al.* (2000) reported the molluscan muscle contains little saturated fat and significant amount of Vitamin *C. Molluscs* are also a good source of minerals such as calcium, potassium, zinc, iron, phosphorus and copper.

As the world population is growing, the per capita consumption of seafood is also increasing rapidly. Because of health consciousness, the modern day man is interested in taking seafood more in view of its nutritional superiority than all other sources of food accessible to him. There remains no considerable study on bivalve with regard to their nutritive value for human consumption. Although clams are being consumed in some parts of India and other country, very limited studies have been made on *D. variabilis* as edible. In view of that, the present work was aimed to study the proximate composition of *D. variabilis* through estimating their major biochemical components such as total protein, carbohydrate, lipid and fatty acid content in the whole body tissue.

MATERIALS AND METHODS

For biochemical studies every month 20 specimens *Donax variabilis were* collected from (January 2018 to December 2018) Nagapattinam marine South east coast of Tamil Nadu and were brought to the laboratory in large plastic troughs and acclimatized for one week. Healthy, *Donax variabilis* were sacrificed in the tissues of gill, foot and muscle tissues were dissected, removed and fixed in 10% formalin on the spot. The total protein of clam was analyzed by Lowry's method (Lowry *et al.*, 1951). The carbohydrates content can be measured by Anthrone method (Hedge and Hofreiter, 1962). Lipid content was measured by following method (Folch *et al.*, 1957). Fatty acid methyl esterifcation of fatty acids in clam meal is performed in accordance with following method described by Anon (2000).

RESULTS

The proximate compositions (%) such as protein, carbohydrate, lipid and fatty acid contents of *D. variabilis* were estimated and the results of proximate composition revealed that protein was found to be dominant (20 %) followed by carbohydrate (18 %), lipid (12 %) and fatty acid (18%). The study animal marine clam *D. variabilis* biochemical values of different tissues are presented in Table 1.

Gill

The Protein content of gills ranged from 9 to 16%, carbohydrate was ranged between 8 and 12%, lipid from 7 to 12% and fatty acid from11 to 18% (Fig.1).

Foot

The Protein content of gills ranged from 10 to 16%, carbohydrate was ranged between 11 and 17%, lipid from 5 to 8% and fatty acid from 2 to 4% (Fig. 2).

Muscle

The Protein content of gills ranged between 12 and 20%, carbohydrate was ranged from 13 to 20%, lipid between 7 and 12% and fatty acid from 9 to 14% (Fig. 3).

Season-wise

The present study proximate compositions season-wise recorded. The carbohydrate content was recorded minimum during monsoon (November 2018) and maximum in postmonsoon (Jan.). The protein content was recorded maximum during post monsoon (January 2018) and minimum in monsoon (November 2018). Lipid content maximum was recorded during post monsoon (January 2018) and minimum during pre-monsoon (August 2018). The fatty acid maximum was recorded in post monsoon (January 2018) and minimum during monsoon (November 2018).

Table 1. Biochemical composition of *D. variabilis* during the study period of January 2018 to December 2018.

SAMPLE	NAME OF THE TEST LIST	JAN.	FEB.	MAR.	APR	MAY	JUN	JUL	AUG	SEP	OCT	NEV	DEC
GILLS	CARBOHYDRATE	10	12	12	10	10	8	9	9	11	8	8	12
	PROTEIN	16	15	15	13	11	11	10	11	12	10	9	11
	LIPID	11	12	10	9	9	9	8	10	10	7	8	9
	FATTY ACIDS	18	16	16	15	12	15	12	14	15	12	11	17
FOOT	CARBOHYDRATE	17	16	15	14	13	13	11	12	14	12	12	15
	PROTEIN	16	15	13	12	12	11	13	12	13	11	10	14
	LIPID	7	8	5	5	6	7	4	5	7	6	6	8

	FATTY ACIDS	3	4	4	3	2	3	2	3	3	2	2	4
MUSCLE	CARBOHYDRATE	18	20	18	16	17	15	14	16	14	13	17	19
	PROTEIN	20	19	21	18	15	16	13	15	12	15	18	20
	LIPID	12	9	11	10	10	9	8	8	7	9	10	11
	FATTY ACIDS	14	11	13	12	9	11	10	12	11	10	9	13

Figure 1: Biochemical composition (mg/g) of in gill tissues of *D. variabilis*

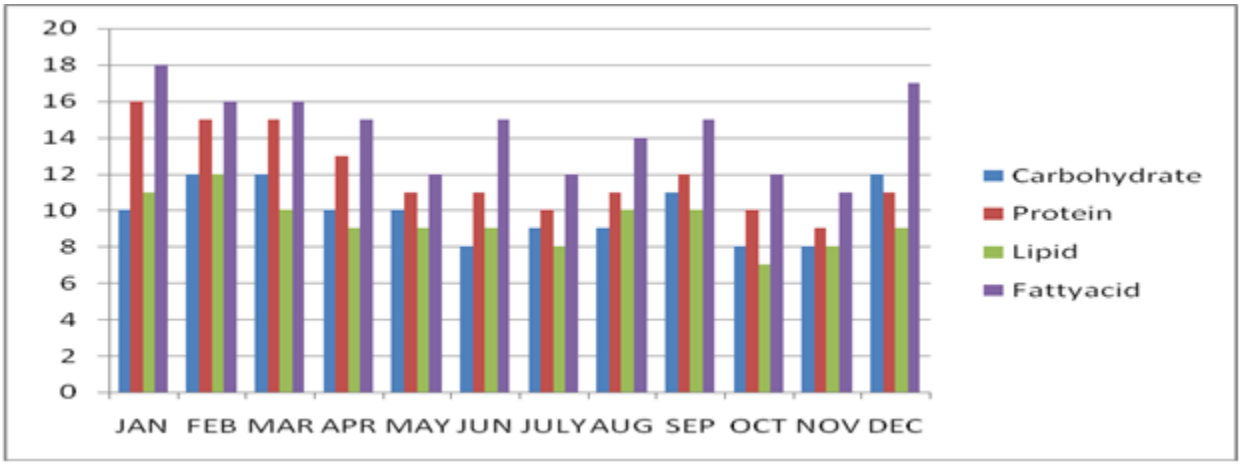


Figure 2. Biochemical composition (mg/g) in foot tissues of marine clam *D. variabilis*

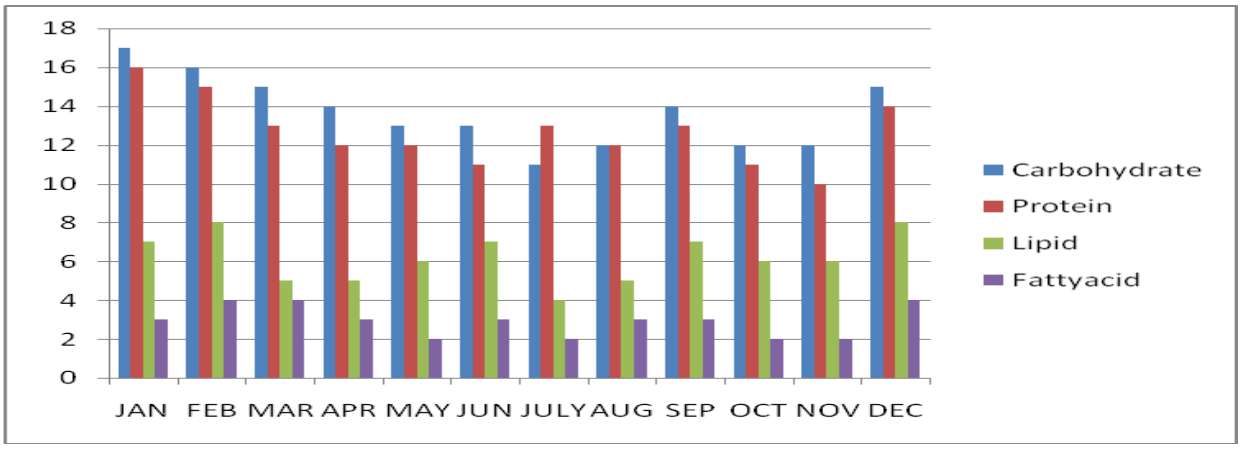
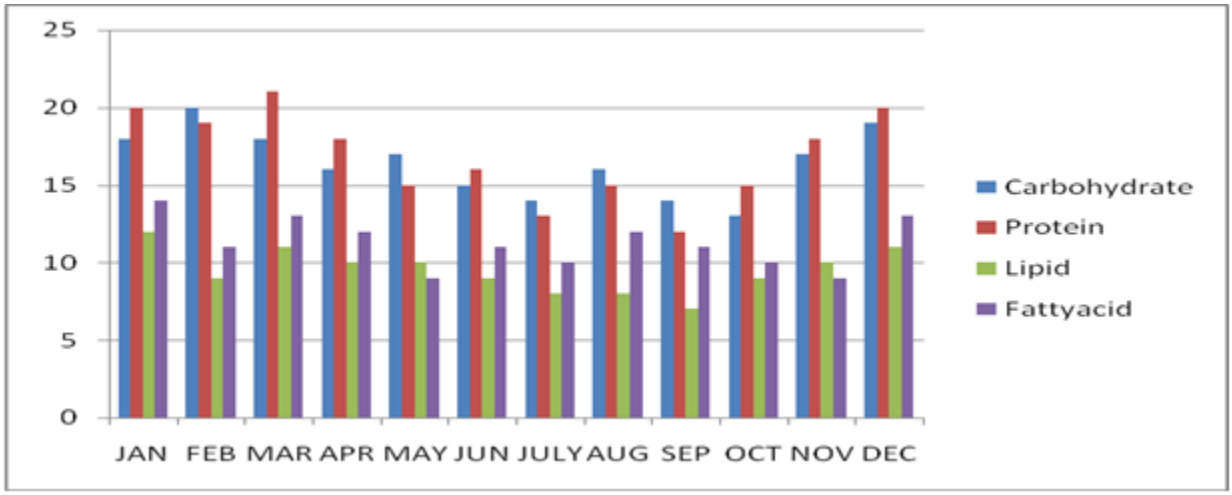


Figure 3. Biochemical composition (mg/g) in the muscle tissues of marine clam *D. variabilis*



DISCUSSION

Biochemical studies are much important from the nutritional point of view. The biochemical constituents in animals are known to vary with season, size of the animal, stage of maturity, temperature and availability of food etc. Biochemical components such as protein, carbohydrates and lipids are essential for body growth and maintenance. The results of the present study revealed that the protein content in *D. cuneatus* was about 23.93%. The molluscs are reported to contain high amount of protein ranged between 40 - 78 % (Anandakumar, 1986). The protein content was about 44.8 and 46.1% in males and females of *Rapana rapiformis* respectively. In the earliar researcher Arularasan, 2009 has studied the protein content on male and female species of an edible sea snail of *Strombus canarium* that has protein content in the range from 47.86 to 70.18% taken from Gulf of Mannar. Shanmugam *et al*. (2001) have mentioned the protein level of *Bursa spinosa* which varied from 18.71 to 29.81% at Parangipettai coast. 23.51% of protein was observed by Periyasamy *et al*. (2014) on marine bivalve *Donax incarnatus* at Cuddalore coast.

In similar study, the percentage of carbohydrates in the body tissue of *D. cuneatus* was about 8.3 % (Rajkumar, 1995). The reported that carbohydrates reserve may be utilized under unfavorable conditions generally in molluscs and the greater variation found in the tissue indicates that the level of mobilized carbohydrate reserves may fluctuate widely and rapidly in response to fluctuation in condition. The estimation that maximum levels (5.31%) of carbohydrate was observed in *L. quadricentus* and (4.69%) in *N. pyramidalis* (Ansell *et al*., 1973). The results obtained from the present investigation concealed that the carbohydrate content was found to be high in *D. cuneatus* compared to other mollusks (Thivakaran, 1988). Carbohydrate levels of 0.84 % to 3.04% are noticed on *Pythia plicata* by Shanmugam (1987). When compared with fish, the molluscan species are very cheap and economically valued.

Lipids are highly efficient as sources of energy and they contain more than twice the energy of carbohydrates and proteins. In the present study, lipid content of *D. cuneatus* was reported as 1.24 % (Okuzumi and Fujii 2000). However, the reported lipid content in *Rapana rapiformis* ranged between 0.85 - 2.12% in male and 0.95 - 2.96% in female (Rajkumar, 1995). In *Babylonia zeylanica* and *Pleuroploca trapezium* species 10.38% and 1.97% of highest lipid content were noticed by Nirmal (1995).

Earliar worker Shanmugam (2007) has reported the *Donax cuneatus* to contain good quantity of saturated, mono and polyunsaturated fatty acids in the range of 35.28%, 12.71%, 11.72% respectively. In general, sea food is one of the most nutritionally balanced foods which helps to control weight and goes a long way towards preventing heart diseases. The nutritional values of bivalve are not brought to the limelight so far, so consumption of these nutrient rich molluscs has not attracted attention. The results of the present study provide ample information about the nutritional values such as protein, carbohydrate and lipid composition which suggested consuming the clam, *D. variabilis.* In addition, the presence of fatty acids, in *D. variabilis* adds more value through the possibility.

CONCLUSION

Present study indicates that provide ample information about the nutritional values such as protein, carbohydrate and lipid composition which suggested consuming the clam, *D. variabilis.* In addition, the presence of fatty acids, in *D. variabilis* adds more value through the possibility.

Acknowledgements

Author is grateful thanks to the Principal, Head of the Department and other staff members of Zoology, TBML College, Porayar, Chennai, India for providing necessary facilities.

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