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Research Paper

Biochemical Composition of Donax Spp. of Kushalnagar Beach, West Coast, Kerala

Bioscience

KEYWORDS : Spawning, Protein, Clam, Gametogenesis.

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ABSTRACT

Bivalves comprise the major marine fishery resource; as they are rich in biochemical compounds. The aim of the present study was to investigate the seasonal variation in the total protein, lipid and carbohydrate content of the clams; Donax incarnatus and Donax faba for a period of two years (June 2012 to May 2014) along Kushalnagar beach. The protein content was found to be relatively high during the entire study period except for a slight decrease during spawning. The lipid content followed a similar trend by increasing during the period of active gamete formation and declining during the spawning period. The carbohydrate levels showed an inverse relationship with protein and lipid with an increase during the spawning period and decrease during the maturation of gametes.

INTRODUCTION

Bivalves play an important role in maintaining the equilibrium of an ecosystem and constitute an important economic endpoint. They are important representatives of the primary consumers and therefore, an important link in the aquatic food chain (Hamdani and Soltani-Mazouni, 2011). Bivalves are abundant along the Indian shores and many people depend on them for food (Singh *et al*., 2012). *Donax incarnatus* and *Donax faba* are filter feeders belonging to the family Donacidae and are commonly found on the sandy beaches of India (Alagarswami, 1966; George, 2000). Consumption of such marine molluscs provides an inexpensive source of protein with a high biological value, essential minerals and vitamins (Periyasamy *et al*., 2014).

With the increasing demand for protein rich food in the developing countries, the knowledge of the nutritional composition of edible organisms is highly important (Nagabhushanam and Mane, 1978). Further, understanding the relationship between the chemical compositions of a mollusc and its environment is essential not only from the point of view of its economic importance but also from the point of sustainable utilization of the resource, including their culture, and conservation and management. In India, literature on *Donax* species is scanty despite the presence of rich diversity (Singh *et al*., 2012). Thus the present study has been undertaken to understand the seasonal variation in the biochemical composition of *Donax incarnatus* and *Donax faba*.

MATERIALS AND METHODS

Study area and sample collection

Kushalnagar beach (12°18’11.63’’N and 75°4’41.74’’E) is a sandy beach situated in Kasaragod, Kerala, India. The samples were collected on a monthly basis by random hand picking and brought to the laboratory alive for a period of two years from June 2012 to May 2014. The bivalves were identified based on the external as well as internal shell characters using available literature. The present study was carried out on two *Donax* species, i.e., *D. faba* and *D. incarnatus*. The meat was separated from the shell, blotted to remove excess water and dried at 60°C for 48hrs. The dried samples were powdered and stored until further use. No distinction was made based on the sex for the biochemical analysis.

Nutrient analysis

Lowry’s method was adopted for the estimation of total protein (Lowry *et al*., 1951) and the lipid content was determined by the chloroform-methanol extraction procedure of Folch *et al*., (1956). Carbohydrate content was estimated by following the phenol-sulphuric acid method (Dubois *et al*., 1956). The ash content was determined gravimetrically using muffle furnace (550°C for 6-8 hrs) (AOAC, 1990).

RESULTS AND DISCUSSION

The seasonal variations in biochemical composition observed during the experimental period are shown in tables 1-2. The seasonal variation in the biochemical composition of *D. incarnatus* was found to be 49.11-64.48 %, 08.03-14.72 %, 14.12-25.76 % and 07.07-18.71 % of the tissue dry weight for proteins, lipids, carbohydrates and ash content respectively. While in *D. faba*, the protein content was about 47.45-61.91%, lipids were between 07.84-13.96, carbohydrates varied from 13.18-24.22% and the ash content was 10.83-21.38 %.

From the tables 1-2, it was determined that the protein content of *D. incarnatus* and *D. faba* was relatively high throughout the study period. Both protein and lipid content was highest during the pre-monsoon and post-monsoon periods and decreased drastically during the monsoon season. Generally, almost all bivalves show an increased level of protein with a decline during the spawning period and an increase during gamete maturation (Deshmukh, 1972; Nagabhushanam and Talikhedkar, 1977; Nagabhushanam and Mane, 1978; Shafakatullah and Krishnamoorthy, 2014). This pattern is also repeated in case of lipid content. The results of the present study followed a similar trend with an increase during gonadal development and depletion during spawning.

Carbohydrate is the second major nutrient in bivalves. Carbohydrate content showed a great variation with the reproductive cycle and was inversely proportional to the protein and lipid content. The carbohydrate content decreased with the advancement of gametogenesis and increased during spawning. This might be because of the utilization of carbohydrates for the development of gametes (Giese *et al*., 1967; Nagabhushanam and Talikhedkar, 1977; Ansell *et al*., 1980; Shafakatullah *et al*., 2013).The variation in the ash content of tissues was similar to that of carbohydrates.

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Table 1: Biochemical composition in the whole body of *Donax incarnatus*

Months	Protein (%)	Lipid (%)	Carbohydrate (%)	Ash (%)
Jun-12	64.48	13.53	14.75	07.23
Jul-12	52.55	08.03	25.76	13.54
Aug-12	49.61	09.61	23.82	16.76
Sep-12	50.57	11.43	21.54	15.64
Oct-12	56.82	11.54	18.35	13.1
Nov-12	61.28	14.07	15.66	09.01
Dec-12	53.15	08.51	22.3	16.12
Jan-13	56.42	10.26	17.08	15.72
Feb-13	54.42	12.44	20.13	12.01
Mar-13	56.23	12.29	19.11	11.81
Apr-13	60.59	12.93	17.09	09.49
May-13	64.34	12.74	14.35	08.17
Jun-13	53.27	14.34	24.2	08.27
Jul-13	52.11	08.14	22.01	17.54
Aug-13	55.19	10.25	20.12	14.21
Sep-13	57.28	10.97	19.84	11.48
Oct-13	56.83	10.26	18.75	13.54
Nov-13	59.07	12.11	16.26	11.74
Dec-13	62.61	14.72	15.06	07.07
Jan-14	49.11	08.64	23.61	18.71
Feb-14	53.13	10.89	20.73	14.33
Mar-14	56.27	12.93	18.7	12.01
Apr-14	61.65	13.07	16.26	09.12
May-14	63.31	13.14	14.12	08.51

Results are the mean of triplicates expressed in percentage

Table 2: Biochemical composition in the whole body of *Donax faba*

Months	Protein (%)	Lipid (%)	Carbohydrate (%)	Ash (%)
Jun-12	61.5	13.07	13.98	11.35
Jul-12	50.09	09.84	24.22	15.62
Aug-12	47.45	08.69	22.56	21.38
Sep-12	54.91	10.42	19.87	13.9
Oct-12	57.18	11.86	16.36	14.8
Nov-12	60.13	13.28	14.78	11.69
Dec-12	52.69	08.42	21.59	16.71
Jan-13	54.71	10.81	18.81	15.21
Feb-13	55.96	12.16	17.92	13.26
Mar-13	57.83	11.96	18.1	11.72
Apr-13	59.17	12.75	16.86	11.32
May-13	61.91	13.31	14.04	10.83
Jun-13	51.32	09.24	23.25	16.21
Jul-13	50.45	08.13	22.07	19.2
Aug-13	54.22	10.86	20.23	14.13
Sep-13	56.19	11.83	18.27	13.28
Oct-13	57.58	12.58	16.92	12.82
Nov-13	58.93	13.07	15.24	11.79
Dec-13	60.39	13.96	13.18	11.82
Jan-14	47.53	07.84	23.02	21.28
Feb-14	53.11	10.69	20.16	15.92
Mar-14	56.93	11.76	18.05	13.34
Apr-14	59.17	12.81	15.34	12.75
May-14	60.66	12.96	14.28	11.3

Results are the mean of triplicates expressed in percentage

CONCLUSION

From the present study it is evident that there is a significant seasonal variation in the biochemical composition of the bivalves. It shows that the bivalves of *Donax* spp. can be used as a valuable source of essential nutrients in poor and developing countries.

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