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Short Communication

Biochemical components of a solitary ascidian *Microcosmus exasperatus* Heller, 1878 (Ascidiacea: Pyuridae)

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Abstract

The biochemical components (protein, carbohydrate and lipid) including amino and fatty acids in a solitary ascidian *Microcosmus exasperatus* were analysed from Palk Bay region (southeast coast of India) in March 2009. The aim of this study is to demonstrate the nutritive value. Moisture, protein, carbohydrate, lipids and ash contents were 67.01±5.9%, 24.7±3.65%, 4.97±2.82%, 2.64±1.11% and 1.03±0.4% in dry weight, respectively. Among 18 essential and non essential amino acids, ten essential and seven non-essential amino acids were reported in ascidian muscle. In essential amino acids, leucine and in non-essential amino acids, tyrosin were recorded in maximum level. The saturated fatty acid (SAFA), monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) contents ranged from 0.131 to 1.612%, 1.304 to 1.546%, and 1.021 to 1.732% of total fatty acids, respectively.

Keywords: Ascidian, *Microcosmus exasperatus*, amino acids, fatty acids

Introduction

Microcosmus exasperatus Heller, 1878 is a solitary ascidian (order: Stolidobranchia, family: Pyuridae) that inhabits shallow rocky littoral habitats, particularly in bays and harbours. Marine ascidians are a rich source of unique and biologically active secondary metabolites and have attracted the interest of both chemists and pharmacologists (Faulkner, 2000). It is considered as highly nutritious seafood. In the present study, we report the nutritional quality (biochemical composition) of solitary ascidian *M. exasperatus*.

Material and Methods

The ascidians, *M. exasperatus* were (Ascidiacea: Pyuridae) collected from Gopalapattinam, Palk Bay, southeast coast of India, during low tide by SCUBA diving in March 2009. The collected ascidians were washed with seawater to remove the epiphytes and then washed with distilled water to remove salts and extraneous materials. They were brought to the laboratory and acclimatized. From mature organisms, 60 to 80 g of muscle was taken for analysis.

Protein, carbohydrate**,** and lipid contents were estimated following the standard methods of Raymont *et al.* (1964), Dubois *et al.* (1956) and Folch *et al.* (1957) respectively. The ascidian muscles were dried at 60ºC for 24 hours in an oven and the dried samples were finely ground for estimating the amino acids in the HPLC (Merck Hitachi L-7400) following the method of Baker and Han (1994). The fatty and methyl esters of the sample were injected into the gas chromatography (GC-6890) capillary column coated with 5% phenyl silicone at a temperature of 170º to 300º C for 23.33 minutes. Flame ionization times of different fatty acid samples were identified following the method of (AOAC 1994). Triplicate samples were analysed for each component.

Results

The composition of moisture, protein, carbohydrate, lipids and ash were 67.01±5.9, 24.7±3.65, 4.97 ± 2.82, 2.64 ± 1.11 and 1.03 ± 0.4% in dry weight, respectively. The concentration of 18 amino acids including 10 essential and 8 non-essential are given in Table 1 & 2. Among the essential amino acids the concentration of leucine was the maximum (6.455 ± 0.8%) and among the

Table 1. Essential amino acid composition (%) in the muscle of *M. exasperatus* on dry weight basis

Sl. No.	Essential amino acid	Composition (%)
1.	Valine	1.245 ± 0.1
2.	Methionine	1.785 ± 0.2
3.	Threonine	3.567 ± 0.4
4.	Isoleucine	3.456 ± 0.4
5.	Leucine	6.455 ± 0.8
6.	Histidine	1.344 ± 0.1
7.	Lysine	4.345 ± 0.5
8.	Tryptophan	0.676 ± 0.1
9.	Arginine	3.455 ± 0.4
10.	Phenylalanine	0.893 ± 0.1
	Total	27.221 ± 3.4

Table 2. Non-essential amino acid composition (%) in the muscle of *M. exasperatus* on dry weight basis

Sl. No.	Non Essential amino acid	Composition (%)
1.	Asparagine	0.245 ± 0.1
2.	Aspartic acid	T
3.	Glutamtic acid	T
4.	Alanine	T
5.	Glycine	T
6.	Serine	T
7.	Crystine	0.875 ± 0.1
8.	Tyrosine	2.874 ± 0.3
	Total	3.994 ± 0.4

T (Trace) = <0.1%

non-essential amino acids, the concentration of tyrosine was the maximum (2.874 ± 0.3%).

The total amount of saturated fatty acids was 2.356 ± 0.2% (Table 3). Among the four individual saturated fatty acids, [a]C18:0 was maximum (1.612 ± 0.2%) and [a]C16:0 was minimum (0.131 ± 0.01%). Two monounsaturated fatty acids [b]C18:1ω 9c (1.304 ± 0.1%) and [b]C18:1ω 7c (1.546 ± 0.2%) were recorded. Among polyunsaturated fatty acids, [c]C18:2 (1.732 ± 0.2%) was the maximum and [c]C18:4 was the minimum and present in traces (Table 3).

Discussion

In *M. exasperatus*, protein was found to be the major constituent. The values reported here are comparable with those reported by Park *et al.* (1991); Kuhne (1997) and Kowalke *et al.* (2001). High levels of protein occur in body components of the Antarctic solitary ascidian *Cnemidocarpa verrucosa* and reflect the contribution of insoluble protein to structural materials including connective tissue (Kott, 1989; McClintock *et al*., 1991). The protein content is positively related to salinity of water (Raymont and Conover, 1961). Carbohydrates constitute only a minor percentage of total biochemical composition. The lipid content was very low as compared to protein and carbohydrate. The lower value of lipids in ascidians was reported by Park *et al.* (1991).

Table 3. Fatty acid composition (%) in the muscle of *M. exasperatus* on dry weight basis

Fatty acid	Fatty acid	Composition (%)
[a]C14:0	Myristic acid	0.412 ± 0.05
[a]C16:0	Palmitic acid	0.131 ± 0.01
[a]C17:0	Margaric acid	0.201 ± 0.02
[a]C18:0	Stearic acid	1.612 ± 0.2
[b]C18:1ù 9c	Olecic acid	1.304 ± 0.1
[b]C18:1ù 7c	Octadecenoic acid	1.546 ± 0.2
[c]C18:2	Linoleic acid	1.732 ± 0.2
[c]C18:3	Alpha linolenic acid	1.021 ± 0.1
[c]C18:4	Moroctic acid	T
Total	Saturated fatty acids	2.356 ± 0.2
Total	Monounsaturated fatty acids	2.85 ± 0.3
Total	Polyunsaturated fatty acids	2.753 ± 0.3

T (Trace) = <0.1%

Madin *et al.* (1981) investigated North Atlantic salp (Tunicata: Thaliacea) species and found proteins to be the major contributor which corresponded to 26.6% of the dry weight. The higher protein concentration measured by Madin *et al.* (1981) is likely to have resulted from lower lipid content in the salps. Biological value of protein is obviously reflected upon its essential amino acids concentration. As far as total essential amino and non-essential amino acids were concerned they constituted 27.221 and 3.994% respectively and were comparable with the reports by Watanabe (1983); Park *et al*. (1990, 1991) in solitary ascidians. In the present study, nine fatty acids are reported in the ascidian muscle. Our result is very similar to the

findings of Nanton and Castell (1999) who found significantly higher content of PUFA in harpacticoid copepods. At intermediate temperature (15°C), the PUFA were the lowest whereas MUFA were at their highest levels in both *Amonardia* and *Tisbe*, perhaps making up for the lower levels of PUFA. The results from this study may help in developing appropriate diets for human nutrition and especially ascidian culture which is popular in Japan and Korea.

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