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SPECTROPHOTOMETRIC STUDIES OF A SIMPLE ASCIDIAN *ASCIDIA SYDNEIENSIS*

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ABSTRACT

Chemical and biochemical substances present in marine organisms are a rich source of structurally novel and biologically active metabolites. The present study was carried out to analyse the total carbohydrates, proteins, lipids, phenols and flavonoids from the simple ascidian *Ascidia sydneiensis.* The results showed that the specimen was rich in flavonoids (49.81%) followed by proteins (28.76%), lipids (23.94%), phenols (8.59%) and carbohydrates (5.08%). A*scidia sydneiensis* possess higher percentage of flavonoid and lower carbohydrate. Observations suggest that this commonly available ascidian has active biochemical potential possessing antioxidant, anti-inflammatory and antimicrobial properties for curing various ailments which can lead to the isolation of new and novel compounds.

Key words: *Ascidia sydneiensis*, Carbohydrates, Proteins, Lipids, Phenols, Flavonoids.

INTRODUCTION

The bioactive chemical constituents have medicinal values producing definite physiological effects on human body. These natural compounds form the base of modern drugs[1]. From time immemorial, marine organisms have been closely associated with human life and are exhaustively used in numerous ways as a source of food, medicine[2,3]. Marine organisms contain a significant amount of carbohydrates, proteins and lipids, which are essential for human beings[4]. Ascidians are excellent materials for several studies like tissue regeneration, immunology, budding, colony organization and bioaccumulation of elements like vanadium and zinc[5]. Ascidians contain a wealth of interesting pharmacological substances[6]. Marine ascidians have been the focus of intensive chemical investigation in recent years and they are very rich sources for unique and biologically active secondary metabolites, which serve as chemical defence[7-10]. Carbohydrates, proteins and lipids are directly involved in energy production, growth and development. These are widely distributed in nature, occurring in one form to another in virtually all organisms having a key role in metabolic processes such as respiration and nutrient assimilation. They are also used as industrial raw material, food additives and as precursors of pharmacologically active metabolites in pharmaceutical compounds such as antipsychotic drugs[11-13]. Studies on the proximate composition and nutritive value of twenty five species of ascidians including 14 colonial and 11 simple ascidians indicated that they are rich with respect to proteins[14]. Similar results have been reported with studies on colonial ascidian *Ecteinascidia venui*[15]. An analysis of the

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simple ascidian *Microcosmus exasperatus* showed the presence of vitamins, phenolic compounds and flavonoids[16]. Preliminary chemical screening of the dried, powdered sample of *Ascidia sydneiensis* subjected to qualitative tests identified 19 chemical constituents[17]. The present study was aimed to estimate the quantity of carbohydrates, proteins, lipids, phenols and flavonoids in *Ascidia sydneiensis.*

EXPERIMENTAL

Materials and methods

Collection of animal material

Ascidia sydneiensis (Family: Ascidiidae) was collected from Tuticorin coast in the month of April 2013 by SCUBA diving (Plate-1). They were identified using key to identification of Indian ascidians[14]. A voucher specimen AS 2252 has been submitted in the ascidian collections of the museum of Department of Zoology, A. P. C. Mahalaxmi College for Women, Tuticorin – 628 002, Tamilnadu, India (Plate-1).

Plate 1: *Ascidia sydneiensis* Savigny, 1816

Systematic position

Ascidia sydneiensis belongs to Phylum: Chordata, Subphylum: Urochordata, Class: Ascidiacea, Order: Enterogona, Suborder: Phlebobranchia, Family: Ascidiidae, Genus: *Ascidia* and Species: *sydneiensis.*

Preparation of extract

The specimen was thoroughly washed with sea water. Epibionts and other particles like sand and shell pieces adhering to the surface of the specimen were carefully removed. They were brought to the laboratory and washed again. The whole colony was dried in shade and homogenized to get a coarse powder. 0.5 g of the dry powder was ground in a mortar and pestle with ten times volume of 80% ethanol. The homogenate was centrifuged at 10,000 rpm for 20 min and the supernatant was collected. The residue was re-extracted with five times the volume of 80% ethanol, centrifuged and the supernatants were pooled and evaporated to dryness. The residue was dissolved in 10% trichloroacetic acid for the analysis of carbohydrates and proteins. The residue dissolved in chloroform was used for the analysis of lipid. Residue dissolved in ethanol was used for the analysis of phenols and flavonoids.

Chemical analysis

Total carbohydrate was estimated by Anthrone method[18]. Lowry et al. method was followed for quantification of total proteins[19]. The procedure suggested by Bragdon was adopted to determine total lipids[20]. Total phenols were assayed by Folin-ciocalteu reagent method[21]. Aluminium chloride method was followed to find out total flavonoids[22].

Spectrophotometric studies

Elico SC-177 Scanning mini spectrophotometer was used for the measurement of absorbance at various concentrations of the ethanolic extract under study. The extract was prepared just before the experiment so as to prevent any further degradation.

RESULTS AND DISCUSSION

The results obtained in the present study are shown in Table 1 and Fig. 1. In *Ascidia sydneiensis*, a lower percentage (5.08) of carbohydrate was observed. This may indicate that carbohydrates play an insignificant role in the energy reserves of these ascidians, which are sedentary animals with hermaphroditic gonads. This fact is supported by early work also[23]. Sugar moieties in many bioactive natural products not only increase their water solubility and bioavailability, but also decrease toxicity[24].

Table 1: Percentage of carbohydrate, protein and lipid in *Ascidia sydneiensis*

Nutrients	Percentage
Carbohydrate	5.08
Protein	28.76
Lipid	23.94
Phenol	8.59
Flavonoid	49.81

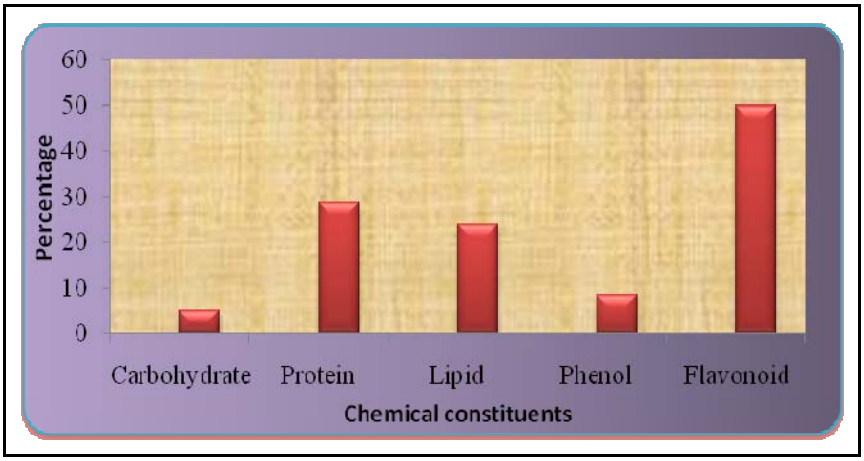

Fig. 1: Percentage of carbohydrate, protein, lipid, phenol and flavonoid in *Ascidia sydneiensis*

In the present study, total protein was 28.76%. Proteins are the primary components of living organisms. The proteins in ascidians increase their food value or that it acts as a bioactive compound, which could be isolated and assayed for biomedical potential[25]. The total lipid content was 23.94%, which was highest among all the nutrients studied. This suggests their use as essential oils, oleoresins and natural food colors, with a strong foundation in research and development[26]. Lipids act as energy reserve to assist recovery during maturation of gonads and spawning[27]. The total phenolic content was 8.59% in *Ascidia sydneiensis.* Phenols have been known to possess a capacity to scavenge free radicals. The antioxidant activity is principally due to their redox properties, which allow them to act as reducing agents, hydrogen donor[28]. The presence of phenols in food is particularly important for their oxidative stability and

antimicrobial protection. Phenolic compounds possess wide spectrum biochemical activities such as antioxidant, antimutagenic, anticarcinogenic as well as the ability to modify the gene expression[29]. 49.81% of total flavonoid was observed during the study. Flavonoids are a group of polyphenolic compounds with known properties, which include free radical scavenging, inhibition of hydrolytic, oxidative enzymes and anti-inflammatory action[30]. These are vital in combating the free radicals, which damage human cells[31]. Numerous epidemiological studies also confirm significant relationship between high dietary intake of flavonoids and reduction of cardiovascular and carcinogenic risk[32].

CONCLUSION

The present study suggests that the extract of *Ascidia sydneiensis* possess chemical and biochemical components such as carbohydrates, proteins, lipids, phenols and flavonoids having the potency for the synthesis of drug molecules in future. It has been found that the natural products derived from ascidians have tremendous importance in pharmaceutical and biomedical field.

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