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Proximate Composition of Two Sea Cucumber Species *Holothuria pavra* and *Holothuria arenicola* in Persian Gulf

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ABSTRACT

This study compared the chemical compositions of sea cucumbers harvested from the Bndar-e-lengeh coast in South of Iran July 2011. Their Moisture, ash, protein, and fat contents were measured and recorded. The average protein, moisture, ash, crude fiber and fat were 17.61±.95%, 67.82±3.81%, 32.74±1.17%, 1.87±0.50% an d 2.43±0.53% in H.parva and 24.37±1.93%, 69.45±3.09%, 10.86±0.4%, 2.29±0.5% and 2.88±0.47% in H.arenicola respectively. Crude fat and moisture content doesn't show any significant difference (p> 0.05). Significant variations were also observed between protein, ash and crude fiber contents (p<0.05) which ash content in H.parva *was more than* H.arenicola *otherwise protein and crud fiber content in H.arenicola were more than* H.pavra*(p< 0.05).*

Keywords: Sea cucumber, chemical composition, Persian Gulf.

INTRODUCTION

The sea cucumber belongs to the Echinoderm phylum. It has been a traditional tonic food in many Asian countries for thousands of years. In China, 134 species have been found, among which only 20 species are edible and of medicinal functions [1]. They are usually marketed as frozen, cooked-dried, cooked-salted and cooked-salted-dried products [2].they live on rocky substrata, soft sediments and phanerogam sea grass beds, in depths that vary between 0 and 100 m [3]. In the oceans, there are hundreds of varieties of sea cucumbers. Although the commercial value of species grown in different areas under different conditions can range from a few to thousands of US dollars per kilogram, no detailed comparison has been made of their chemical components and nutritional value. With the development of the food industry, various kinds of nutriments and tonic products are now made of the sea cucumber, including dried products (beche-de-mer), pickled products, water-risen products, oral liquids and capsules.

The major edible parts of sea cucumber are the body wall mainly consisting of collagen and mucopolysaccharides. More than 21 types of collagen have so far been identified in various tissues and their roles have been investigated [4].

Sea cucumbers are well known to exert beneficial effects on human health. These echinoderms are used in Asian traditional medicine to maintain fitness during long fishing travels or to prevent, reduce or cure several Ailments like constipation, renal deficiency or arthritis. Several papers published in the last two decades came in support to these medicinal purposes showing multiple biological activities of sea cucumber extracts as wound healing promoter and exhibiting antimicrobial, anticancer, and immunomodulatory properties [5-8].

However, there were only a few reports about chemical composition being used in the geographical classification of aquatic food materials. Furthermore, the chemical composition of sea cucumbers are influenced by the local environmental factors especially the water environment.

In Iran, sea cucumbers are not well known and they are not consumed as food, although they have been consumed in many countries for hundreds of years. Few studies on sea cucumbers in Iran were carried out [9-12] Therefore, there is scarce information regarding to *H. parva* and *H.arenicola*, which are commonly observed in Bandar-e-Lengeh coast. There is no information exists relating to most sea cucumber species of Iran in terms of their proximate composition. Therefore, we aimed to study the proximate composition of two species of fresh sea cucumbers; *H. parva* and *H.arenicola* from coastal regions of Iran.

MATERIALS AND METHODS

Sea cucumber samples

Sea cucumber samples including *Holothuria arenicola* (10 specimens) and *Holothuria parva* (10 specimens) were collected during low tide from the Bndar-e-lengeh coast in South of Iran July 2011(Fig 1).They were kept in iced boxes and transported to the laboratory where they were washed with cold water, weighed and measured.

Analyses of protein

Total protein was determined by using Kjeldahl method [13]. A conversion factor of 6.25 was used to convert total nitrogen to crude protein for all varieties of fish.

Moisture, Ash and fiber analyses

The muscle was homogenized by food processor (Braun Combimax 600), and moisture content of 5 g of homogenized sample was determined by drying the sample in oven at 105˚ C until a constant mass was obtained [14]. Ash and Fiber were determined by using the basic AOAC method [14] by heating the samples in the furnace at 550 ˚C for 8–12 h. Each sample analyzed three times.

Lipid analyses

Total lipids of sea cucumber species were extracted (separately) according to the Bligh and Dyer method [15]. After phase equilibration, the lower Chloroform layer (TL) was removed and dried in a rotary vacuum evaporator at 32 ◦C. The extracted lipids were weighed in order to determine the TL, and then redissolved in chloroform/methanol (9:1, v/v) and finally stored at 0 ◦C until used. Additionally, in order for that to be confirmed, aliquots were evaporated in preweighed

vials to constant weight to determine the lipid content. To prevent oxidation t-butyl-hydroquinone was added to all samples during preparation.

Statistical analysis

Data statistical analysis was carried out with SPSS software and Excel. Data normality checked by using Kolmogrove-smironoff test. Significant difference between chemicals characteristic between two fishes was determined by using t- test about 5% probabilities. Data are expressed as means's., n values are given for each table.

RESULTS

Tables 1 and 2 represent proximate composition (wet weight bases) of two sea cucumber species investigated in this study. The average protein, moisture, ash, crude fiber and fat were 17.61±.95%, 67.82±3.81%, 32.74±1.17%, 1.87±0.50% and 2.43±0.53% in *H.parva* and 24.37±1.93%, 69.45±3.09%, 10.86±0.4%, 2.29±0.5% and 2.88±0.47% in *H.arenicola*, respectively. Crude fat and moisture content does not show any significant difference (p> 0.05) which the highest value of crude fat and moisture were observed for *H.arenicola* (3.73% and 73.59 %), respectively (Fig. 2). Significant variations were also observed between protein, ash and crude fiber contents (p<0.05), where ash content in *H.parva* was more than *H.arenicola;* otherwise, protein and crud fiber content in *H.arenicola* were more than *H.parva* (p< 0.05) (Fig. 3).

Table 1 Proximate composition (% wet weight basis) of *H. parva*

Parameters	Length(cm)	Weight(g)	Ash %	Moisture %	crude fiber %	Protein %	Fat %
Min	10	23	31.56	62.3	0.89	15.8	1.4
Max	12	26	34.98	75.2	2.5	19	3.37
Average	11.11	24.44	32.74	67.92	1.87	17.61	2.43
SD	0.78	1.13	1.17	3.81	0.50	0.95	0.53

Table 2 Proximate composition (% wet weight basis) of *H.arenicola*

Parameters	Length(cm)	Weight(g)	Ash %	Moisture	crude fiber %	Protein %	Fat %
Min	10	21	10.38	62.32	1.48	20.9	2.1
Max	13	24	11.35	73.59	3.2	27.6	3.73
Average	11.55	22.55	10.86	69.49	2.29	24.37	2.88
SD	0.88	1.23	0.40	3.09	0.50	1.93	0.47

Table 3 comparing between results of this study with other regions

Species	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
H.parva (This study)	67.92 ± 3.81	17.61±0.95	2.43±0.53	32.74±1.17
H.arenicola (This study)	69.49 ± 3.09	24.37±1.93	2.88±0.47	10.86±0.40
H. polii (Aydın et al., 2011)	81.24 ± 0.4	8.66 ± 1.2	0.15 ± 0.04	7.85 ± 0.9
H. tubulosa (Aydın et al., 2011)	84.30 ± 0.2	8.82 ± 0.3	0.18 ± 0.05	5.13 ± 0.6
H. mammata (Aydın et al., 2011)	85.24 ± 0.3	7.88 ± 0.3	0.09 ± 0.08	5.13 ± 0.1

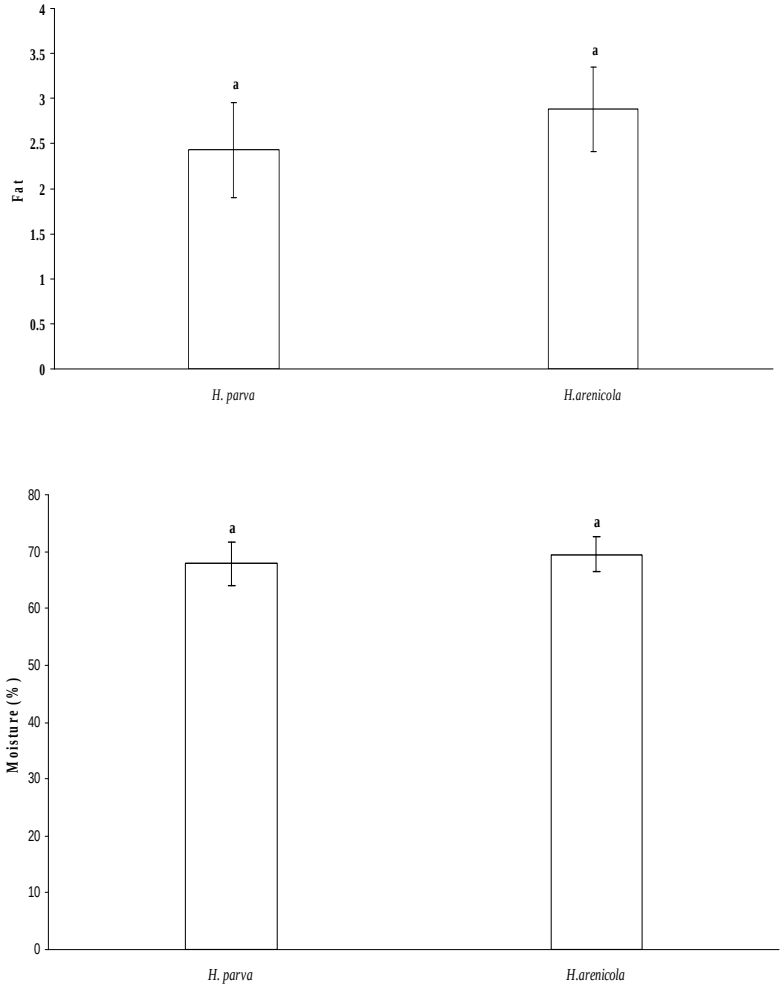
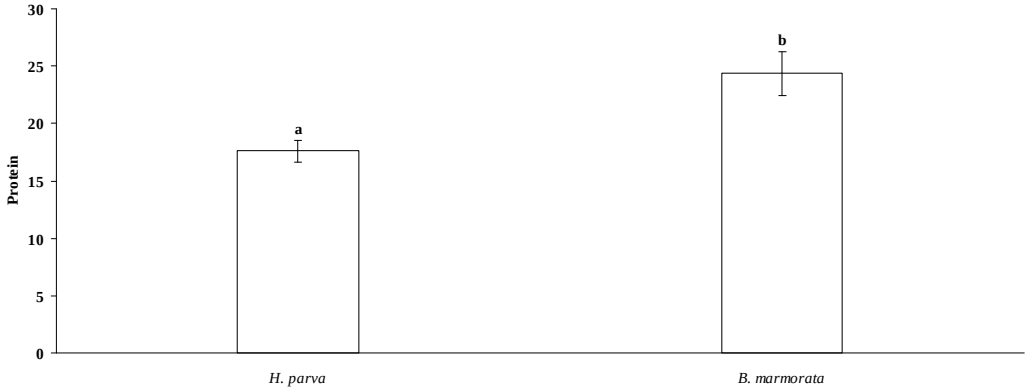


Fig 2 comparison of fat and moisture in *H. parva* and *H.arenicola*



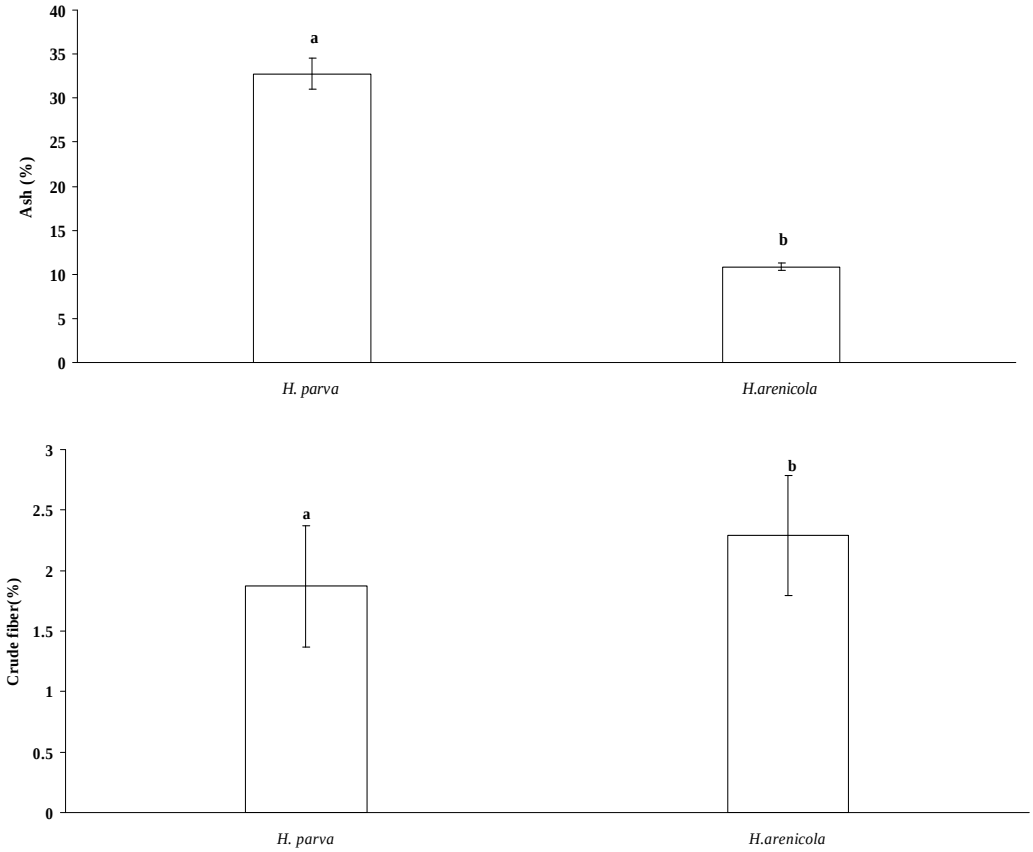


Fig 3 comparison of protein, ash and crud fiber in *H. parva* and *H.arenicola*.

DISCUSSION

Chemical constituents in medicinal materials are the substantial foundations of curative effects, which differ among various regions. For example, sea cucumbers of the same species but in different geographical regions provide discriminative functions in medical applications [16, 17], and thus it requires special treatments in commercial trade and safety management. Because it is impossible for ordinary consumers to distinguish sea cucumbers of various geographical regions, using the sensory methods of sight, smell and taste, it is important to develop methods to differentiate between sea cucumbers from various geographical regions to reassure consumers, protect geographical indication, ensure fair competition, reinforce governmental supervision and permit the implementation of product recall. In recent years, research efforts have been focused on the potential of analytical techniques for the determination of agricultural products; according to geographical origin [18, 19].Sea cucumbers generally contain a higher moisture and lower protein content than marine fish and shellfish. Proximate compositional data for fresh sea cucumbers vary greatly; moisture 82– 92.6%, protein 2.5–13.8%, fat 0.l–0.9%, ash l.5–4.3% and carbohydrate 0–2.2%. [20].

Moisture, protein, fat and ash contents of 3 sea cucumber species from Aegean Sea of Turkey ranged between 81.24% and 85.24%, 7.88% and 8.82%, 0.09% and 0.18%, and 5.13% and 7.85%, respectively, with significant changes among species ($P<0.05$) having been determined[21] . The data found in the present study for protein, fat and ash contents were more than the range reported by Chang-Lee *et al*. [20] and Aydin *et al*. [21] (Table 3).

The protein content is important when considering quality and texture of the muscle of the aquatic animal. Muscles of aquatic animals that contain small amounts of protein tend to lose much water upon cooking, which ruins the texture of the meat. Food resources can affect lipid contents of some holothurians because of their selective feeding and changes in the food supply of sea environment [22].Therefore, it is important to study the biochemical composition of different species of sea cucumbers from different regions.

According to our results, chemical compounds of the sea cucumbers *H.arenicola* and *H. pavra* though coming from the same environmental conditions had differences from each other and from others in the same study. Chemical compounds may be subjected to seasonal variations in feeding behavior [20] or to individual or geographical variations [23]. O¨zer *et al*. [24] also emphasized that handling procedures can affect the chemical composition of sea cucumbers.

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