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BIOCHEMICAL ANALYSIS OF AN ENDEMIC FRESHWATER CRAB, *SARTORIANA SPINIGERA* (WOOD-MASON, 1871) FROM EAST COAST OF INDIA

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ABSTRACT
In the present investigation an attempt has been made to know the biochemical composition of freshwater crab meat of *Sartoriana spinigera* (Wood-Mason, 1871) before and after their spawning seasons during the months of January to March and July to September. The protein content of meat of female crabs varied from 30.03% to 59.29%, lipid 7.01% to 11.29% and ash between 38.75 and 39.44% dry weight, whereas the moisture ranged between 71.26% and 79.51%. The protein, lipid and ash contents were recorded highest during the month of January to March whereas, lowest percentages of these were observed during July to September. The biochemical composition of crab meat having high protein justifies the edible quality of these crabs by humans.

INTRODUCTION

Crab meat is an excellent source of nutrition because of its high protein content comparable with that of other sea-foods (Srinivasagam, 1979). Many investigations have estimated the concentration of various elements in aquatic and biological samples collected from various natural environments (Bryan, 1976; Bu-Olayan and Subramanyam, 1996; Hota *et al.,* 2001; Alasalvar *et al.,* 2002; Ashok *et al.,* 2003). The freshwater crabs are a diverse assemblage of eubrachyurans (Guinot, 1978) distributed throughout the tropical and sub-tropical regions of central and South America, Africa, Madagascar, Southern Europe, Australia and India. There are several varieties of freshwater crabs found in eastern India particularly in Odisha. The food value of such crab meat is believed to be suitable for human consumption due to the presence of high nutritional elements. A particular crab variety *Sartoriana spinigera* (Wood-Mason, 1871) is of particular importance as it is distributed in most part of Odisha State. The literature regarding its nutritional quality and biology is grossly lacking. These crabs remained unnoticed to the biologists and recently this has become vulnerable due to several environmental reasons especially unrestricted pesticide use in rice fields and small water bodies. So, here an attempt has been made to assess the nutritional and biochemical properties of this tiny freshwater crab and assess its nutritional contribution to human food.

MATERIALS AND METHODS

Crab collection

The sample crabs (*S. spinigera*) were collected from different flood plain ecosystems and wet land and also from its surrounding areas (ponds, canals, paddy fields) of Bhadrak, Cuttack and Kendrapara district of Odisha (Fig.1) situated between of 85°31' to 86°31' EL and 20°03' to 20°16' NL. The field study was carried out from January 2010 to September 2011. The crabs were sampled from a statistically valid number of randomly selected sites. About 200 specimens of *S. spinigera* were collected for the study. All the samples collected were packed in polythene bags placed in insulated boxes along with ice and brought to the laboratory of Zoology Department of Utkal University, Odisha for further analysis. The crabs were buried in ice throughout the storage period with re-icing every 24h to maintain a temperature closer to that of ice.

Crab meat collection and proximate composition analysis

Sartoriana spinigera is a seasonal breeder. The males and females show clear sexual dimorphism. Females become mature when carapace width reaches about 45mm; while males attain maturity when a carapace width reaches 50mm. After attaining maturity, females grow slower because most of their accumulated energy is being devoted to egg-production rather than body growth. Few of the female population live long enough to reach a maturity size in most heavily fished crab population. The study was carried out for two years (2010 and 2011). In each year all gravid females were captured on the preselected seasons to determine the most appropriate season for utility. Sampled gravid female crabs (*Sartoriana spinigera*) of live and healthy variety having 35.0 ± 5.0g body

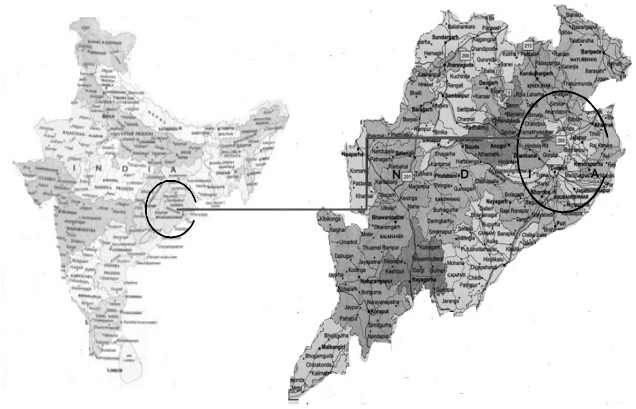

Figure 1: Maps showing study area in the eastern Odisha State of India

weight (40-50mm CW) were selected for meat composition. Randomly ten crabs were selected for each observation in both the years. Carapaces of individual crabs were removed manually. The meat from all body parts of crabs including chelate legs was isolated carefully and transferred to a petridish. All the meat materials were weighed and its percentage was worked out. Crab meats were analyzed as fresh; shells were left at ambient temperature to dry. In the present study, totally 4 contents were reported from crab meat. All assays were conducted in duplicate samples of the homogenates. Crab meat tissue moisture was determined by oven drying to constant weight at 110ºC for 24h. Crude fat was determined by Soxhlet extraction using petroleum ether (60–80ºC boiling point) on a Soxtec System. Crude protein content was determined by Kjeldahl analysis (nitrogen × 6.25; Kjeltec Autoanalyser, Vapodest-50, Gerhald, Germany). All analyses were performed in accordance with the standard methods described by AOAC (2000).

RESULTS AND DISCUSSION

The morphmetric and meristic measurements of different sizes of crabs (*S. spinigera)* were studied. In the present study the total body weight in relation to carapace width (CW) was studied for observing the maturation of crabs after attainment of a definite size. But cheliped and pereiopod length were not included in the said purpose. The gravid female crabs were sexed by examination of the abdominal structures. They were selected in both of their pre-spawning season and in post spawning seasons. The total body weight and width of carapace of gravid female crabs were measured and mean values were determined. The proximate composition of crab tissue meat from total body collected in pre-spawning season and post-spawning season of the year showed significant differences in the moisture, lipid and protein content as shown in Fig. 2(A), B. In the present study, the amount of moisture, ash, lipid and protein content of crab meat collected from the total body tissue in the pre-spawning conditions of *S. spinigera*is shown in Fig. 2(A). The percentage of protein was quantitatively higher in the body tissues of all the specimens as compared to the other elements taken into consideration. It was observed that the female crabs were having more protein and fat contents in pre-spawning seasons than post-spawning conditions. Before spawning season, the moisture content in the crab

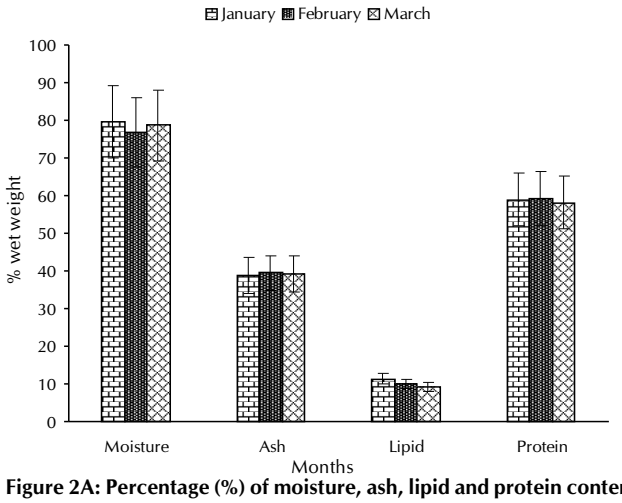

Figure 2A: Percentage (%) of moisture, ash, lipid and protein content of crab meat in pre-spawning seasons (mean values) of two years

meat was maximum at 79.51% in the month of January and minimum of 76.95% in the month of February (mean = 78.39 ± 1.31%). The results of moisture analysis of another variety European green crab ranged from79.1 ± 0.4 to 82.30 ± 0.5% (Naczk *et al.,* 2004). Skonberg and Perkins (2002) found 79.0 ± 0.7% moisture in crab *Carcinusmaenus*. The ash content of *S. spinigera* varied between 38.75 and 39.44% (mean = 39.12 ± 0.34%) with maximum as 39.44% in the month of February and minimum of 38.75 in the month of January. Lipid content ranged between 10.06% to11.29 % (mean = 10.18 ± 1.05%) with maximum value noticed in the pre spawning season as 11.29% in the month of January and minimum was found in the month of March as10.06%. Protein, the major organic constituent in all size groups, varied between and 58.17% and 59.29% (mean = 58.78 ± 0.56%) with maximum as 59.29% in the month of February and minimum of 58.17% in the month of January in two years of study. The maximum protein value was thus recorded in the crabs before spawning seasons. In a report the protein content of meat of deep-water brachyuran crab, *Charybdis smithii* varied from 59.8 to 71.1% and lipid from 6.2 to 8.2 % whereas, the water content ranged between 85.5 and 89.6% (Balasubramanian, 2001). All these values are close to the

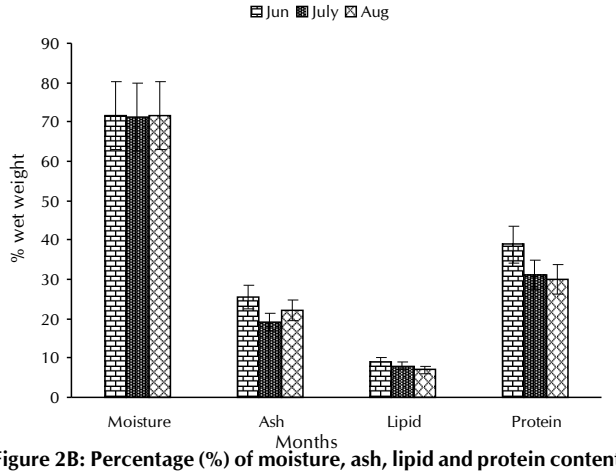

Figure 2B: Percentage (%) of moisture, ash, lipid and protein content of crab meat in post-spawning seasons (mean values) of two years

findings of present study.

As shown in Fig. 2(B), there was a significant difference in the moisture, ash, lipid and protein content of meat of crab *S. spinigera* of various size groups in post spawning seasons than their pre spawning seasons. The moisture content fluctuated between 71.26% and 71.58% (mean = 71.41 ± 0.16%) with maximum amount in the month of July as 71.58% and minimum of 71.26% in the month of August. The ash content of *S. spinigera* varied between 25.55% and 22.01% (mean = 22.27±3.15%) with a maximum of 25.55% in the month of July and minimum of 19.25% in the month of August. Lipid content ranged between7.01% and 9.04% (mean =7.98±1.01%). The maximum lipid value was noticed as 9.04% in the month of July and minimum of 7.01% in the month of September. Protein, the major organic constituent in all size groups, varied between and 30.03% and 38.82% of dry weight (mean = 33.32±4.79%). The maximum protein content was 38.82% in the month of July and minimum of 30.03% in the month of September. The decrease in protein level in the present study might be due to high amount of consumption of energy during egg production in monsoon seasons every year.

Again in another report, it was found that soft shelled crab meat contained 14.31±0.05% of crude protein, 1.67±0.09% of ash, 84.38±0.39% of moisture and 0.18±0.02% of fat (% wet weight) (Benjakul and Sutthipan, 2009). Thus freshwater crab meat samples of the present study gave close values with the meat composition of other freshwater crabs. According to the seasons, the maximum protein value recorded in the meat of *S. spinigera* was before breeding seasons than found after breeding seasons. Based on the present study, it was found that the freshwater crab meat is a good source of proteins, lipids and minerals.

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