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BIOCHEMICAL COMPOSITION AND CALORIFIC VALUES OF THE THREE EDIBLE SPECIES OF PORTUNID CRABS FROM KARACHI

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Claw and body meat of three species of portunid crabs (male and female), viz, *Portunus pelagicus* (Linnaeus), *Portunus sanguinolentus* (Herbst) and *Scylla serrata* (Forskal), were analysed for biochemical composition. Dry tissue contains 85-95% organic matter of which 55-65% is portein. Crab tissue is highly nutritious having C:N values between 3.34:1 and 4.29:1. Percent lipid, carbohydrate and ash contents are low.

Key words: Crab fisheries; Edible crab; Portunid crabs; Metabolic equivalents.

INTRODUCTION

Marine invertebrates are being widely used as food and feed supplement round the world. Crabs among many other invertebrates, are considered as an important shell fishery product. More then twenty two species of crab are being consumed, imported or exported by various countries like China, France, Indonesia, Japan, Philppines, Spain, Thailand, USA, etc. These countries possesed a well established crab fishery and are earning a handfull of foreign exchange. According to FAO fishery statistic report of 1980 (1), the total world catch of crabs was 848,256 metric tons (T) and the nominal catch of swim crabs (*Portunus* spp.) and mud crabs (*Scylla serrata*) was 26,495 and 5,466 T, respectively. These two species are also fairly abundant along the Pakistan coast.

In Pakistan, shell fishery is almost totally dependent upon the harvest of shrimp. Contribution of crabs to our coastal fishery is almost non-existant. According to Pakistan fishery data [2], frozen crabs were exported to Saudi Arabia only in 1974, 1981, 1982 and 1983 during the last fifteen years. Less than one metric ton in 1974 and 1981, 2 T in 1982 and 60 T in 1983 valued at rupees 2-10 thousand, 79 thousand and 1.78 million respectively, were exported. This shows that a properly managed crab fishery can earn a substantial foreign exchange and strengthen the country's economy.

The chemical composition and nutritive value of crab meat have been extensively investigated in various parts of the world [3-16]. From Pakistan only fragmentry data are available on the biochemical composition of shell fish like oyster and mussel [17-21]. These data on the crab species have not been reported earlier. It is desireable to elucidate the nutritive quality of edible crab of our coast for improving consumption and export. In the present study three crab species (both male and female) were investigated for identifying their nutritive values and emphasising proper utilization of this precious oceanic potential of Pakistan.

MATERIALS AND METHODS

Three species of edible crabs namely, *Portunus pelagicus* (Linnaeus), *P. sanguinolentus* (Herbst) and *Scylla serrata* (Forskal) were collected in June, 1985. *P. pelagicus* was fished with baited line from Karachi (back waters). *P. sanguinolentus* was caught with a hand seine from the open beach of Clifton. It is important to note that no male crab was found entangled in the net even after several attempts. *S. serrata,* the mud crab, was hand picked from mud flats of Korangi creek.

Meat from the body and claw portions was separated and after wet weighing the samples were subjected to drying at 70° in a hot air oven for 24 hrs. Dried and powdered samples were sieved through 0.5 mm^2 mesh and analyzed for protein [22], lipid [23], carbohydrate [24], total nitrogen [25], oxidizable organic carbon [26], ash and water [27]. Calorific content was calculated from major metabolites (13) and percent organic carbon [28]. All observations were recorded in triplicate and averaged for presentation in results.

RESULTS AND DISSCUSION

Organic and caloric contents of edible portions of three crab species are summarised in Table 1. The data

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depitcts higher values for moisture content in *P. sanguinolentus*. Total inorganic content in tissue components of crabs is lowest in the body meat of *S. serrata* (female) and highest in the claw meat of *P. sanguinolentus* (female). Comparatively higher values of ash were recorded for claw meat of *P. pelagicus* (female) and *P. sanguinolentus* (body and claw meat). Total organic matter followed a reverse pattern to that of the ash content.

Protein makes up 55 to 65 percent of dry tissue weight in crabs. *P. pelagicus* (female) and *S. serrata* (female) have low protein in claw meat, whereas the reverse is true for *P. sanguinolentus* and males of the other two species. Percent lipid and carbohydrate constituents of crab tissue are quite low. This shows that lipid and carbohydrate do not store in tissues but, on the contrary, utilized by the body as a source of energy. Comparatively higher values for both lipid (in body meat) and carbohydrate (in claw meat) were encountered in *S. serrata* (female).

Total nitrogen and total oxidizable organic carbon showed little variation in their percent values among the species. However, slightly elevated values for organic carbon were recorded for *S. serrata*. Values for both nitrogen and carbon were found low in the claw meat (*P. pelagicus;* female) and high in the body meat (*S. serrate;* female). Carbon to nitrogen ratio (C:N) being low, reflects a high nutritional potential of crab's tissue. *P. pelagicus* can be

Table 1. Organic constitution of meat components of three species of edible crabs.

Species of crabs		Water % WTW	Ash g% DTW	Organic matter % DTW	Protein % DTW	Lipid g% DTW	Carbo-hydrate g% DTW	Total nitrogen g% DTW	Organic carbon g% DTW	C:N	Claorific value Kcal/g. By Using metabolite equivalent	Claorific value Kcal/g. By Using organic carbon
Portunus pelagicus												
Male	Body Meat	78.15	6.60	93.40	65.20	5.13	2.88	8.40	31.12	3.70	2.83	4.50
	Claw Meat	79.05	7.23	92.77	57.66	5.53	2.48	9.04	30.22	3.34	2.90	4.37
Female	Body Meat	77.03	7.26	92.74	56.33	3.64	1.78	8.41	30.90	3.67	2.65	4.47
	Claw Meat	78.01	11.30	88.70	55.00	4.33	1.68	8.03	29.79	3.71	2.66	4.30
Scylla serrata												
Male	Body Meat	75.01	6.11	93.89	60.26	4.10	1.83	8.96	34.35	3.8	2.85	4.99
	Claw Meat	74.65	5.92	94.08	64.30	5.55	1.48	8.12	34.80	4.29	3.13	5.06
Female	Body Meat	74.49	5.36	94.64	60.73	6.19	2.51	9.37	35.11	3.75	3.09	5.11
	Claw Meat	77.97	6.11	93.89	56.34	5.24	3.89	9.34	33.96	3.64	2.88	4.93
Portunus sanguinolentus												
Female	Body Meat	78.87	12.00	88.00	59.33	5.76	1.37	9.01	31.86	3.54	2.94	4.62
	Claw Meat	78.86	14.44	85.56	64.61	6.10	1.06	8.55	32.01	3.74	3.17	4.64

*WTW.= Wet tissue weight; DTW = Dry tissue weight.

Table 2. Average values (% wet weight) of organic contents in different species reported from various parts of the world. (Modified from Sidwell *et. al.* 1974).

Location	Species	Moisture	Ash	Protein	Fat	Carbohydrate	Source
USA	*Callinectes sapidus*	81.20	1.6	16.10	1.0	1.25	4, 8, 11,
USA	*Cancer magister*	80.50	1.4	17.20	1.4	----	3, 8, 12,
India	*Naptunus* spp.	78.40	1.45	16.50	0.5	0.30	10
USA, Japan	*Paralithodes camtschatica*	80.70	1.6	17.20	0.7	----	8, 9,
India, Philppines	*Scylla serrata*	80.30	1.8	14.90	2.9	0.60	5, 7, 10,
Pakistan	*Portunus pelagicus*	78.06	1.78	12.35	1.02	0.48	Present Study
Pakistan	*P. sanguinotantus*	78.87	2.79	13.09	1.25	0.26	"
Pakistan	*Scylla serrata*	75.53	1.44	14.78	1.29	0.59	" "

considered as most nutritious since it has the lowest C:N value. Low values of C:N reflects a low non-protein fraction of organic matter [29].

Energy content showed consistently higher values when measured from percent organic carbon, over the values measured by using metabolite equivelent. The higher caloric values can be attributed to some carbon sources other than major metabolites. The unmeasured fraction of organic matter, the refractive protein [30], when converted to calories elevates the energy content measured from metabolites to the values calculated from organic carbon.

Table 2 elicits average percent values for moisture, ash, protein, lipid and carbohydrate in wet tissues of various crab species reported from other countries. Data recorded in the present study were converted from per cent dry tissue weight to wet tissue weight in order to facilitate comparision with crab species reported from elsewhere. It is clearly revealed (Table 2 that the present results are in good agreement with other data. Sidwell *et al.* [13] concludes that variability among species can be expected due to the seasonal variations in the environment. Age, size, and sex of the individuals also have an equal contribution in this regard.

It is important to undertake coordinated studies on seasonal variation in chemical composition of crab tissue and their biology. Likewise, population structure and growth studies of abundently available and commercially important species are also inevitable for the management of crab fishery purely on scientific basis in Pakistan.

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