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Comparative Analysis of Biochemical parameters of Mysids from Coastal, Estuarine and Saltpan waters

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ABSTRACT

Mysids or opossum shrimps are component of zooplankton composition which is used for human consumption. *Mesopodopsis orientalis* is a common mysid of the shallow coastal waters of India. Mysids have high calorific values. The hard parts of animals consist of a variety of minerals, some of which occur in static organs (statocysts) as components of the static bodies, statoliths, or otoliths. Salt pan mysids found more nutritionally rich than estuarine and coastal water mysids respectively. However, Nutritional parameters as Fat found more in coastal water mysids, whereas in Estuarine waters mysids are Protein, Carbohydrate, Magnesium, Iron and in Salt pan waters Carbohydrate, Sodium and Potassium. But some nutritional parameters not detected in all waters mysids viz, coastal, estuarine and salt pan are Sugar, Trance fatty acids, Cholesterol and Vitamin A. Since, Salt pan mysids are more nutritionally rich than estuarine and coastal water mysids respectively, it is recommended that salt pan mysids will be preferred for culturing which could be more resultant for effective use of live feed for fishes of different ecological waters.

Keywords: Opossum shrimps, shallow coastal waters, statocysts, high calorific values, live feed.

INTRODUCTION

Mysids or opossum shrimps are component of zooplankton composition which is used for human consumption. *Mesopodopsis orientalis* is a common mysid of the shallow coastal waters of India. It is a small, shrimp like arthropod belonging to the Order *Mysidacea* of the class *Crustacea*. This is locally called as "Lepa" or "Banda Kolim" which is smaller than "Acetes" i.e. "Jawla". Due to their high nutritive quality, this species is suitable for aquaculture as a live feed (Nakhwa 2023, Biju et.al., 2009). Bhattacharya and Kewalramani (1972) observed that *M. orientalis* could survive even in fresh water for considerable time after gradual acclimatization. Mysids have high calorific values (Kazmi and Sultana, 2008; Biju and Panampunnayil, 2009; Eusebio *et al.* 2010). The hard parts of animals consist of a

variety of minerals, some of which occur in static organs (statocysts) as components of the static bodies, statoliths, or otoliths (Lowenstam, 1981). In this research work the comparative study was therefore undertaken to analyse different nutritional properties of mysids from coastal, estuarine and saltpan waters.

MATERIAL AND METHODS

Mysids are collected using hand trawl made of Sari netting during low tide period at surface water and from coastal, estuarine and saltpans regions during spring as also nip tides of every month manually during May 2016 to December 2017. The study was carried out monthly basis from:

1. one site from Coastal area (Girgaon Chaoupati).,
2. three sites from mangrove estuarine areas (Juchandra, Thane and "Kandalvan" at Mauze – Mulund/Bhandup) the Eastern suburb of Mumbai, lying along the Western bank of Thane creek. and
3. three sites from Saltpans (Airoli, Vasai and Naigaon) from different parts viz., reservoirs, condensers and crystallizers.

Laboratory work

Protein content was estimated by the Folin–Phenol method of Lowry *et al.* (1951) using bovine serum albumin as a standard. Protein measurement with the Folin phenol reagent. micro-Kjeldahl method (AOAC, 1975).

Parameters	Methods for analysis	
	Fresh mysids and acetes	Dry mysids and acetes
Moisture (%)	AOAC952.08 AOAC952.08	
Fat(%)	IS9808:1981	AOAC 948.15
Protein(%)	EL/SOP/549	AOAC 2001.11
Ash(%)	AOAC938.08	
Carbohydrate (%)	IS1656:2007,RA2012	
Energy (Kcal/100g)	EL/SOP/509	by calculation
Sugar	IS6287:1985,RA2010	RCAL/MUM/CHEM/SOP NO.16
Fatty Acid Profile		
Trance fatty acids (g/100g)	AOAC996.06	AOCS:CE IE-91
Saturated fatty acids (g/100gm)	AOAC996.06	AOCS:CE IE-91
Monounsaturated fatty acids (g/100g)	AOAC996.06	AOCS:CE IE-91
Polyunsaturated fatty acids (g/100g)	AOAC996.06	AOCS:CE IE-91
Highly Unsaturated Fatty Acids		
Docosohexaenoic acid (mg/kg)		By *Gas chromatography*
Eicosapentaneonic acid(mg/kg)		By *Gas chromatography*
Minerals		
Cholesterol mg/100g	RCAL/MUM/CHEM/SOP NO.28	
Calcium (mg/100g)	EL/SOP/534	RCAL/MUM/CHEM/SOP NO.40
Magnesium (mg/100g)	EL/SOP/594	RCAL/MUM/CHEM/SOP NO.40
Sodium (mg/100g)	EL/SOP/534	AOAC969.23
Iron (Mg/100gm)	EL/SOP/534	RCAL/MUM/CHEM/SOP NO.40
Potassium as K (Mg/100g)	EL/SOP/594	AOAC969.23
Vitamin A	HPLC	HPLC
AOAC : Association of Official Analytical Chemists		
ICP-OES : Inductively Coupled Plasma Optical Emission Spectroscopy		

AOAC952.08 : Accreditation Office list of accredited laboratories Association of Official Method of Analytical Chemists
IS9808:1981 : Indian Standards
AOCS : American Oil Chemists' Society
EL/SOP/534 : Envirocare Lab/Standard Operating Procedure/534
HPLC : High Performance Liquid Chromatography
AOAC : The American Oil Chemists' Society
RCAL/MUM/CHEM/SOPNO.28 : RCALab/Mumbai/Chemical/Standard Operating Procedure
Form 28 ICP-MS : Inductively Coupled Plasma Mass Spectrometry.

RESULT

Comparative Analysis of Nutritional properties of Mysids from Coastal, Estuarine and Saltpan waters

Protein: It is found in this research work, Mysids from estuarine waters contained significantly higher level of protein in percentage shown 12.8 (±1.369306). Whereas 4.7(±1.37332) protein g/100g found in saltpan water mysids followed by 1.46(±0.353553) in coastal waters mysids.

Fatty acids: Fatty acid in g/100g was found negligible ranging from 0.01 to 0.61 g/100g i.e. too negligible in estuarine water mysids but nothing was found in coastal as also in saltpan water mysids. viz., Trance fatty acid: >0.01, Saturated fatty acids was found 0.61(±0.324068). Monounsaturated fatty acids were 0.57(±0.327185) and Polysaturated fatty acids: 0.22 (±0.0141422) in estuarine water mysids, whereas in coastal waters as also in saltpan water mysid fatty acid was not detected.

Minerals: As far as minerals (mg/100g) are concerned, estuarine and saltpan water mysids found higher minerals than coastal mysids in fact it was found so negligible as Less than 0.01mg/100g in coastal waters. Viz., Calcium: 51.6 (±0.67) found in estuarine waters and, 22 (±0.92), Magnesium: 12.5 (±0.66) and, 0 mg/100g found in estuarine and saltpan waters mysids respectively; Sodium: 38.5 (±1.89) and 406 (±1.89) was found in estuarine water and saltpan water mysids respectively which shows saltpan waters mysids are more enriched by sodium than estuarine waters mysids. Iron: 4.43 (±1.58) by and 0.81 (±0.18) was detected in estuarine and saltpan water samples but nothing was found in coastal water mysids. Surprisingly Potassium found significantly higher in saltpan water mysids than estuarine followed by coastal water mysids viz., Potassium as K: 0.03 (±0.45), 14.1 (±0.42) and 49.6 (0.12) found in coastal, estuarine and saltpan water mysids.

Moisture: Moisture in percentage was found 94.04 (±0.06671), 87.98 (±35.32994) and 91.8 (±: 0.066718) found in coastal, estuarine and saltpan water mysids. It shows coastal water mysids contain higher moisture contents than saltpan waters followed by estuarine waters mysids and

Ash in percentage was found 3.55 (±0.066708), 1.96 (± 0.06683) and 1.90 (±0.06671) was found in coastal, estuarine and saltpan waters mysids respectively.

Vitamins in all three water samples of mysids viz., coastal, estuarine as also in saltpan waters was found BLQ – Below Limit of Quantification.

Table 1: Comparative Analysis of Biochemistry parameters of Mysids from Coastal, Estuarine and Saltpan waters

S.N.	Parameters	Coastal	Estuarine	Saltpans
1	Moisture (%)	94.04±0.06	87.98±0.79	91.8±0.55
2	Fat(%)	35.15±0.46	34.95±0.25	34.92±0.15
3	Protein (%)	1.46±0.35	12.8±0.15	4.7±0.22
4	Ash (%)	3.55±0.51	1.96±0.67	1.90±0.69
5	Carbohydrate (%)	1.10±0.79	0.62±0.38	1.2±0.66
6	Sugar	Not detected	Not detected	0
	Fatty Acid Profile			
7	Trance fatty acids (g/100g)	Not detected	< 0.01	0
8	Saturated fatty acids (g/100gm)	Not detected	0.61±0.25	0
9	Monounsaturated fatty acids (g/100g)	Not detected	0.57±0.32	0
10	Polyunsaturated fatty acids (g/100g)	Not detected	0.22±0.01	0
	Minerals			
11	Cholesterol mg/100g	Not detected	Not detected	0
12	Calcium (mg/100g)	< 0.01	51.6±0.66	22±0.92
13	Magnesium (mg/100g)	0	12.5±0.64	0
14	Sodium (mg/100g)	< 0.01	38.5±0.29	406±0.47
15	Iron (Mg/100gm)	2.62±0.63	4.43±0.58	0.81±0.18
16	Potassium as K (Mg/100g)	0.03±0.01	14.1±0.45	49.6±0.70
17	Vitamin A	BLQ	BLQ	BLQ
	Average parameters	7.26	13.70	32.26

BLQ– Below Limit of Quantification, LOQ– Limit of Quantification, LOQ–5mg/100g (Cholesterol, Vitamin A), LOQ– 0.01mg/100g (Magnesium as Mg), LOQ– 0.01 mg/Kg

Table 2: Average Biochemistry parameters of Mysids from All waters viz., Coastal, Estuarine and Saltpan waters

S.N.	Parameters	Result
1	Moisture g/100g	91.27±0.33
2	Fat g/100g	35±0.55
3	Protein (%)	6.32±0.19
4	Ash(%)	2.47±0.15
5	Carbohydrate (%)	0.97±0.15
7	Sugar	0
	Fatty Acid Profile	
8	Trance fatty acids (g/100g)	0
9	Saturated fatty acids (g/100gm)	0.61±0.63
10	Monounsaturated fatty acids (g/100g)	0.57±0.39
11	Polyunsaturated fatty acids (g/100g)	0.22±0.12
	Minerals	
12	Cholesterol mg/100g	0
13	Calcium (mg/100g)	36.8±0.40
14	Magnesium (mg/100g)	12.5±0.64
15	Sodium (mg/100g)	222.25±0.29
16	Iron (Mg/100gm)	**2.62±0.63**
17	Potassium as K (Mg/100g)	21.24±0.21
18	Vitamin A	BLQ

Average Biochemistry parameters of Mysids from all waters viz., Coastal, Estuarine and Saltpan waters

Average mean value of moisture (g/100g) found 91.27±0.33, Fat (g/100g) found 35 ±0.55, Protein (%) was 6.32 ±0.19, Ash (%) found 2.47 ±0.15, Carbohydrate (%) detected as 0.97 ±0.15, Energy (Kcal/100g) was found 35.50 ±0.77, Sugar content was found nil in mysids from all waters viz., coastal, estuarine and saltpans. Among Fatty Acid Profile, Trance fatty acids was found nil., Saturated fatty acid was shown 0.61 ±0.63, Monounsaturated fatty acids was 0.57 ±0.39 and Polyunsaturated fatty acid was found 0.22 ±0.12, In Minerals, no cholesterol was detected in mysids, Calcium (mg/100g) shown 36.8 ±0.40, Magnesium (mg/100g) was 12.5 ±0.64, Sodium (mg/100g) was found 222.25 ±0.29, Iron (Mg/100gm) was 2.62 ±0.63, Chromium (ppm) was found 0.26 ±0.01, Vitamin A found BLQ (Below Limit of Quantification) but no Cholesterol was detected in mysids of all waters.

DISCUSSION

Nutritional properties of Mysids from Coastal, Estuarine and Saltpan waters

Mysids have high calorific values (Kazmi and Sultana, 2008; Biju and Panampunnayil, 2009; Eusebio *et al.* 2010). Carbohydrate of zooplankton ranged from 65.5 to 127.4 mg. g^{-1} (=85.78±16.92), organic carbon varied from 334.9 to 461.2 mg. g^{-1} (=380.44±33.6) and calorific values varied from 2.2 to 5.4 (=3.5±.94) k.cal. g^{-1}((Rao and Ratnakumari 2002).

Protein contents (% of dry weight) of different life stages varied from 65.6%- 74.8% in M. orienralis, 52%-63.5% in *M. zeylanica* and 70.6% - 73.7% in R. indicus. R. indicus showed high protein content (avg.72.46 ± 1), while in *M. orientalis* and *M. zeylanica* the average protein content was 69.72,1.48, and 58.40 ± 2.35 respectively. (Biju 2008).

Eusebio, (2010) showed the potential of mysids *Mesopodopsis orientalis* as live food source for grouper *Epinephelus fuscoguttatus* larvae was investigated. In comparison with Artemia biomass, a common live food source in larviculture, mysids contained significantly higher levels of protein, total lipid, eicosapentaenoic acid (EPA, C_{20}:5n−3), and docosahexaenoic acid (DHA, C_{22}:6n−3). DHA was not detected in Artemia biomass. Results of the nutritional evaluation suggest that mysids are superior live food organisms than Artemia biomass for grouper larvae and could significantly improve production of grouper juveniles in the nursery phase.

This research work clearly indicates protein contents in estuarine waters mysids found significantly higher

level than salt pans and in coastal water mysids. But Carbohydrate shows that mysids from coastal waters have higher level followed by saltpan and estuarine waters mysids. Fatty acids like Trance fatty acid, saturated fatty acids, MUFA and PUFA was found too negligible in estuarine mysids but was found totally absent in coastal as also in saltpan water mysids. As far as minerals are concerned Calcium and Magnesium, in estuarine and saltpan mysids found higher minerals than coastal mysids in fact it was found as negligible as Less than 0.01mg/100g in coastal waters. Saltpan waters mysids are more enriched by Sodium than estuarine waters mysids and coastal water mysids. Whereas estuarine waters mysids are more enriched by Iron than coastal and salt pan waters mysids; Potassium as K found significantly higher in saltpan water mysids than estuarine followed by coastal water mysids; Moisture content was found more in coastal, than saltpan and estuarine mysids and Ash was found more in coastal than estuarine and saltpan waters mysids. Whereas Vitamin A was found BLQ – Below Limit of Quantification in all three water samples of mysids viz., coastal, estuarine as also in saltpan waters.

CONCLUSION

As Salt pan mysids are more nutritionally rich than estuarine and coastal water mysids respectively, it is recommended that salt pan mysids will be preferred for culturing which could be more resultant for effective use of live feed for fishes of different ecological waters.

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