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Proximate and mineral composition of calanoid copepod *Sinodiaptomus (Rhinediaptomus) indicus*

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ABSTRACT

Hatchery techniques and methods for mass production of several aquaculture species advanced markedly. The technology for mass culture of zooplankton has developed considerably, but adequate information on the effect of population density on the propagation of Calanoid Copepod is not available. The effect of different nutrient sources viz. yeast, chlorella and poultry manure on propagation of live food organisms was studied. Data on the proximal and mineral composition of food organism were analysed. There were minor differences in the mineral composition except that the zinc content was found to be less. The nutritional quality of live food organism with respect to protein, lipid and carbohydrate showed negligible differences with that of *Artemia* taken as control. This study highlights the importance of copepod *Sinodiapttomus* (*Rhinediaptomus*) *indicus*, as an efficient food source for fin fishes and larvae of prawns.

Key words: Minerals, Yeast, Finfish, Poultry Manure, *Chlorella*.

INTRODUCTION

A wide variety of live food organisms are utilized in fish larviculture, mainly because of their nutritional value, which is higher than that of artificial diets. Copepods are a well known natural source of food for fish larvae and fingerlings. Copepods from wild sources as well as cultured in suitable conditions can be used. The culture methods for marine Copepods are well advanced (Ogle, 1979, Paym and Rippingale, 2001), but relatively few attempts have been made to culture fresh water copepods. One example may be a method of mass culture of *Paracyclops fimbriatus* developed recently by Szlauer (1995) based on the observations made from a mass occurrence (13000 individuals/litre) during experiments on municipal sewage sludge. The aim of the current study was to evaluate the nutritional quality in terms of proximate and mineral composition of the freshwater calanoid *S. (R).indicus* from wild and cultured sources, so as to be used as an efficient food source for finfish and prawn larvae.

MATERIAL AND METHODS

Calanoid copepods were collected from a freshwater pond at Madhavaram near Chennai, using plankton net (150 ìm mesh size) by towing at a depth of 1m. Collections were made between 7 a.m and 8 a.m and the samples were brought to the laboratory. The plankton was identified according to the taxonomic descriptions of Edmondston (1959), Rangareddy (1994) and Dussart and Defaye (1995). Mass culture of copepods was achieved using yeast, chlorella and poultry manure in different combinations at 250 ppm. The proximate and mineral contents of wild and cultured *S. (R). indicus* was analysed. The moisture, ash and mineral contents were determined using the standard methods as given in AOAC (1995). Lyophilized samples were analysed for protein by the Lowry's method using Bovine serum albumin as a standard (Lowry *et al.*, 1951). The carbohydrate content was determined by phenol-sulphuric acid method using glucose as a standard (Dubois *et al.*, 1956). The lipid content was determined by following the procedure of Bligh and Dyer (1959). The results obtained in each experiment were analysed statistically using one way analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Investigations of Copepod culture methods and theiruse as natural food fish larvae might help develop more accurate techniques for large scale culture of Copepods, thus making feasible their use as a high quality and easily digestible food. All the diets used in the present study were efficient. The quality of algal lipid present may vary under different nutrient regions. Smaller prey may be particularly suitable for first feeding or for weaker larvae of the stock, being probably easier to capture and consequently consumed at higher rate (Cunha and Plahnas, 1999)

The proximate composition of wild and cultured species of the Calanoid Copepod *S.(R). indicus* showed nutritionally comparable results with that of *Artemia* taken as control is furnished in (Table 1). The carbohydrate content is found to be slightly lesser than *Artemia*. In the present study lipid content of *S. (R). indicus* was found to be slightly higher. The ash and moisture contents of *S. (R). indicus* showed negligible variations among them with respect to culture media. The live food organisms have a high feed value as protein sources for fish (Watanable *et al*., 1983a). The protein, lipid and phosphorus contents in most zooplanktons appeared to satisfy the requirement of fish. The biochemical composition of zooplanktons can vary seasonally and be affected by the level of nutrient in water (Vijverberg and Frank, 1976)

The mineral composition of Calanoid Copepod *S.(R). indicus* collected from wild sources generally showed similar pattern with that of *Artemia* except few minor variations (Table 2). The levels of Na, K and Fe were found to be lesser than that of *Artemia*. The zooplankton generally has greater levels of phosphorus than phytoplankton. Other nutrient contents showed negligible differences among the cultured *S. (R).indicus* with respect to different culture media. But the media containing yeast, chlorella and poultry manure was found to be better than others. Statistical analysis of

Table 1: Comparison of Proximate composition in *Artemia* and *S. (R) indicus*, wild and cultured in different feed combinations (Y, yeast; C, chlorella; PM, poultry manure)

Proximate Composition	*Artemia*	Wild	*S. (R) indicus* Cultured in						ANOVA F; P
(%)			Y	C	PM	Y+C	Y+PM	Y+C+PM	
Moisture	82.25 ± 0.10	81.55± 0.10	81.21± 0.11	80.72± 0.02	80.40± 0.04	82.81± 0.02	81.80± 0.02	80.21± 0.02	1072.83; = 0.000
Protein	8.80 ± 0.13	9.22 ± 0.08	9.42 ± 0.03	9.21 ± 0.02	8.78 ± 0.02	9.48 ± 0.02	8.36 ± 0.02	9.82 ± 0.02	428.95; = 0.000
Carbohydrate	5.22 ± 0.08	4.33± 0.12	3.92 ± 0.03	2.41 ± 0.02	3.89 ± 0.02	4.21 ± 0.02	4.04 ± 0.07	4.23 ± 0.05	987.99; = 0.000
Lipid	2.23 ± 0.14	3.17 ± 0.08	3.21 ± 0.02	3.71 ± 0.02	2.21 ± 0.02	3.61 ± 0.02	2.81 ± 0.02	3.67 ± 0.11	456.18; = 0.000
Ash	0.78 ± 0.01	0.72 ± 0.01	0.61 ± 0.02	0.52 ± 0.02	0.62 ± 0.02	0.72 ± 0.02	0.71 ± 0.02	0.73 ± 0.02	175.04; = 0.000

Values are Mean ± SD of n = 6, Row wise comparison of means (Tukey's test at 0.05 LS):, Moisture: Y+C, Significantly higher than other means; Y+C+PM significantly lower than all other means; Protein: Y+C+PM significantly higher; Y+PM significantly lower; Carbohydrate: *Artemia* significantly higher; C, significantly lower; Lipid: C, Y+C and Y+C+PM, significantly higher; *Artemia* and PM significantly lower; Ash: *Artemia* significantly higher; C, significantly lower;

Table 2: Comparison of mineral composition of Artemia and S. (R) indicus wild and cultured in different feed combinations (Y, yeast; C, chlorella; PM, poultry manure)

Proximate Composition	*Artemia*		*S. (R) indicus* Cultured in						ANOVA F; P
		Wild							
(%)			Y	C	PM	Y+C	Y+PM	Y+C+PM	
Na (mg/g)	1.57 ± 0.04	0.57 ± 0.02	0.48 ± 0.01	0.68 ± 0.02	0.58 ± 0.02	0.66 ± 0.02	0.63 ±0.02	0.73 ± 0.02	1423.53; = 0.000
K (mg/g)	1.07 ± 0.03	0.63 ± 0.01	0.72 ± 0.02	0.52 ± 0.03	0.42 ± 0.02	0.83 ± 0.02	0.73 ±0.02	0.90 ± 0.02	491.01; = 0.000
Ca (mg/g)	0.23 ± 0.01	0.25 ± 0.01	0.33 ± 0.28	0.18 ± 0.01	0.24 ± 0.02	0.31 ± 0.02	0.24 ±0.01	0.41 ± 0.02	3.21; = 0.000
Mg (mg/g)	0.29 ± 0.01	0.27 ± 0.01	0.28 ± 0.01	0.21 ± 0.02	0.25 ± 0.02	0.28 ± 0.01	0.25 ±0.02	0.31 ± 0.02	19.30; = 0.000
P (mg/g)	1.23 ± 0.01	1.25 ± 0.01	1.17 ± 0.02	1.15 ± 0.02	1.21 ± 0.02	1.26 ± 0.01	1.23 ±0.02	1.41 ± 0.02	111.98; = 0.000
Zn (mg/g)	15.70 ± 0.14	21.57 ± 0.14	9.42 ± 0.02	8.73 ± 0.02	9.82 ± 0.02	12.13 ± 0.04	11.61± 0.02	12.32 ± 0.02	2.0 x 104; = 0.000
Fe (mg/g)	49.35 ± 0.10	24.47± 0.20	20.62 ± 0.02	18.72 ± 0.03	19.82 ± 0.02	26.23 ± 0.04	23.82 ±0.03	28.42 ± 0.02	8.6 x 104; = 0.000
Cu (mg/g)	0.52 ± 0.01	2.65 ± 0.10	2.51 ± 0.03	0.81 ± 0.02	2.32 ± 0.02	2.51 ± 0.02	2.42 ±0.02	3.12 ± 0.03	2890.31; = 0.000
Mn (mg/g)	1.88 ± 0.04	1.17 ± 0.10	1.07 ± 0.07	2.71 ± 0.02	0.82 ± 0.02	1.52 ± 0.02	1.32 ±0.02	1.70 ± 0.05	741.38; = 0.000

Values are Mean ± SD of n = 6, Row wise comparison of means (Tukey's test at 0.05 LS):, Na: Artemia significantly higher; Y significantly lower; K: Artemia significantly higher; PM significantly lower; Ca: Y+C+PM significantly higher; Mg: Y+C+PM significantly higher; C, significantly lower; P: Y+C+PM significantly higher; Y and Y significantly lower; Zn: Wild significantly higher; Fe: Artemia, significantly higher; Cu: Y+C+PM, significantly higher; Artemia, significantly lower; Mn; C, significantly higher;

proximate and mineral composition of wild and cultured *S. (R).indicus* showed significance at p<0.05 level. Recent studies show that it is possible to improve the nutritional quality by feeding them diets rich in essential nutrients and that the essential fatty acid content chiefly determines the dietary value for fish and prawn larvae (Watanable *et al*, 1983b). Leger *et al.,*(1987) reported that *Artemia* naupii and adults have high protein, lipid and carbohydrate contents indicating that the macronutrients for most predators as satisfied by them.

Natural zooplankton constitutes ideal food for fish larvae because of the presence of vital enzymes that help in the functioning of the digestive tract. According to Ronnestad *et al.,* (1999), the importance of Calanoid Copepods as natural food in fishponds is that Calanoid species contain more that twice the amount of free amino acids per gram weight than other organisms.

Other feed should be developed to replace those commercially available diets. The calanoid Copepod *S. (R). indicus* might be good alternative, since it is easy to culture and has high nutritional value. Further investigations are in progress to determine the feasibility of large-scale culture of this species to provide sufficient individuals for production of fish larvae. The further studies will throw more light on the simplicity of the feeding techniques involved in the aquaculture feed practice.

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