

BIOCHEMICAL COMPOSITION OF MUSCLE TISSUE OF PENAEID PRAWNS

C.T. ACHUTHANKUTTY AND A.H. PARULEKAR

National Institute of Oceanography, Dona Paula - 403 004, Goa.

ABSTRACT

Biochemical composition of muscle tissue of females belonging to four species of penaeid prawns, viz. *Metapenaeus affinis*, *M. dobsoni*, *Penaeus merguensis* and *Parapenaeopsis stylifera*, inhabiting the coastal waters of Goa, was estimated in relation to degree of maturity. Protein was the significantly dominant component in all the species regardless of maturity conditions while Carbohydrate was present in negligible quantity. Variation in composition of different components did not exhibit any regular pattern even between the different maturity stages of individual species. Statistically no significant difference was noticed in the biochemical composition within or between the species.

Key-words : Biochemical composition, Penaeid prawns, Goa waters.

Studies on the biochemical composition of various organs of prawns are particularly important for the success of shrimp farming as these studies would help to identify the dietary requirements of the candidate species at different stages of growth so as to formulate the suitable feed. Practically, no information is available on the muscle tissue biochemical composition of commercially important penaeid prawns in relation to their maturation except for a brief report by Shaikhmahmud and Magar (1957) on *P. stylifera*. Hence, the present study was undertaken to estimate and compare the major biochemical components of females of *M. affinis*, *M. dobsoni*, *P. merguensis* and *P. stylifera*, inhabiting the coastal waters of Goa, in relation to the maturity condition.

Prawn samples were collected from the commercial trawlers operating in the coastal waters of Goa. After ascertaining the species, female specimens were grouped into five maturity stages based on the structure and colour of the gonad (Rao, 1968). In addition, immature females where gonad development was not discernible, were grouped, separately. Outer shell, gut and gonad were carefully removed. Moisture was determined by drying the pre-weighed tissue in hot air oven at 70 °C to constant weight and is expressed as percentage (Table I). The dried tissue was finely powdered for estimating the other biochemical constituents. Protein was estimated by Biuret method (Raymont, Austin and Linford, 1964), carbohydrate by Sulphuric acid — Phenol method (Dubois, Gilles, Hamilton, Rebers and Smith, 1956) and total lipid by Chloroform — Methanol method (Folch, Lees and Stanley, 1956). Ash content was determined by igniting a known quantity of the dry powder in silica crucible at 500 °C in a muffle furnace for 5-7 hours. The percentage composition of the different components in the four species viz., *M. affinis*, *M. dobsoni*, *P. merguensis* and *P. stylifera*, is given in Table I.

Table I. Biochemical composition of muscle tissue of penaeid prawns. (Values expressed are percentage on dry weight basis and percentage moisture).

Species	Maturity stage	Protein	Carbohydrate	Lipid	Ash	Moisture
<i>M. affinis</i>	Immature	80.73	1.70	5.80	7.67	77.32
	I	80.70	1.57	5.14	7.56	75.70
	II	80.20	7.42	5.23	7.19	75.75
	III	79.53	1.58	5.53	7.21	75.08
	IV	80.47	1.75	5.56	7.29	74.76
	V	78.50	1.71	6.81	8.06	76.61
<i>M. dobsoni</i>	Immature	85.40	1.54	5.70	5.28	76.88
	I	84.40	1.52	5.12	6.15	77.02
	II	83.40	1.81	4.65	6.38	76.35
	III	81.26	1.89	5.32	6.69	74.85
	IV	82.34	1.97	5.34	7.30	75.29
	V	83.33	1.82	5.39	6.50	76.21
<i>P. merguensis</i>	Immature	83.53	1.83	4.97	6.62	76.22
	I	85.70	1.49	4.99	6.49	76.31
	II	85.65	1.99	4.60	6.47	74.99
	III	84.15	2.24	4.37	6.73	74.06
	IV	80.50	2.01	5.50	7.14	74.68
	V	81.57	1.70	5.23	6.69	75.26
<i>P. styliifera</i>	Immature	83.10	1.80	6.22	8.83	74.65
	I	78.67	1.85	8.01	8.62	75.15
	II	82.53	1.73	8.04	7.11	75.97
	III	82.97	1.93	6.97	6.30	75.75
	IV	84.13	1.97	6.70	6.68	75.69
	V	81.30	1.89	7.16	7.15	76.76

When the data was subjected to multiple analysis of variance, it was found that only the biochemical components were significantly different (F , 53.31; df , 3, 45; $p < 0.001$) in all the four species regardless of the maturity condition indicating that protein was the significantly dominant component. Statistically no other significant difference was observed either between the species or between the maturity conditions of individual species.

Protein, undoubtedly, is the most dominant biochemical constituent of muscle tissue of penaeid prawns (Shaikhmahmud and Magar, 1957, 1961; Dabrowskii, Kalakowski and Karnika, 1969; Pillay and Nair, 1973; Sriraman and Reddy, 1977) as was observed in all the four species presently investigated. It should also be pointed out that in all the species, protein content was generally high in young ones as compared to sexually matured specimens.

Due to mobilisation of stored lipid for gonad development, wide fluctuations in lipid composition have been reported to occur both in hepatopancreas and gonads of prawns (George and Patel, 1956; Morris, 1973, Pillay

and Nair, 1973; Gopakumar and Nair, 1975) but this does not affect the lipid composition of muscle tissue to any great extent (Ando, Kanazava, Teshima, Patrois and Ceccaldi, 1977). However, in *P. styliifera*, Shaikhmahmud and Magar (1957) obtained higher lipid content in mature females as compared to the immature ones. On the other hand, Gopakumar and Nair (1975) could not find any appreciable variation in muscle tissue lipid content of any of the five species of penaeid prawns studied. Variation in lipid composition of the present species also did not exhibit any regularity or consistency to suggest that maturity condition influences the lipid composition of muscle tissue. Nevertheless, the results have clearly indicated that of the four species, *P. merguensis*, generally has a low lipid content as compared to *P. styliifera*.

Carbohydrate and ash are, probably, the least studied biochemical components of muscle tissue of penaeid prawns. The former formed only a minor percentage of the total biochemical composition and hence its fluctuation within and also between the species was negligible. As regards ash content, a slight increase with increasing size has been reported in juveniles of *Penaeus monodon* (Sriraman and Reddy, 1977). This situation, however, cannot be expected in the present case as the estimation was not based on size but on the degree of maturity. Nevertheless, a marginal increase was noted in *P. styliifera* and *M. affinis* as compared to the other two species.

There is a general agreement that the biochemical composition of muscle tissue of a particular species of penaeid prawn does not significantly change with size, sex or degree of maturity, not withstanding the minor variations. This was further confirmed by subjecting the data to statistical analysis. Hence, it could be deduced from the present investigation that the muscle tissue biochemical composition of the four species of penaeid prawns from the coastal waters of Goa, is basically similar and the maturity condition does not alter it to any significant extent.

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