

A Comparative Study on Chitosan with Reference to Yield and Viscosity

T. K. THANKAPPAN and P. MADHAVAN
Central Institute of Fisheries Technology, Cochin - 682 029

Chitosan was prepared using shell waste from different species of prawns separately as head and body peelings as well as mixture of these two portions. The proximate composition of these portions, was determined and the yield and viscosity of chitosan, obtained were found out. It was observed that the body shell gave good quality chitosan with higher yield and viscosity than other portions. Among the different species *Penaeus indicus* body shell yielded chitosan with the highest viscosity.

Large quantity of prawn shell waste is available in India comprising of head and body shell which amounts to 70,000 t per annum. At present only a limited quantity of this is utilised as manure or in fish meals and the rest is being thrown out as waste. If properly processed, this waste can be separated into products such as shrimp protein, chitin etc. Chitin can be converted to chitosan by chemical processing, which has got practical applications in industrial fields like textiles, waste water treatment and paper (William Mc. Neely, 1959; Muzzarelli, 1976).

Studies were conducted and suitable methods were developed at the Central Institute of Fisheries Technology, Cochin for the production of chitin and chitosan from prawn shell (Madhavan & Ramachandran Nair, 1974). No comparative account is available on the yield and quality of chitosan from prawn shell of different species and from different body parts. This paper gives a comparison of the quality and yield of chitosan prepared from shell wastes of different species of prawns as well as from different body parts of the same species.

Materials and Methods

Prawn shell of four different species, *Penaeus indicus*, *Metapenaeus dobsoni*, *Parapenaeopsis stylifera* and *Metapenaeus monoceros* were collected from various prawn peeling centres situated in and around Cochin. Shells from medium sized (300 - 400 nos/kg) prawns were used in these studies. Initial analysis of the raw material was carried out for moisture, ash, fat and protein as per the methods of AOAC (1960). The procedure followed for the preparation of chitin/chitosan was as described by Madhavan & Ramachandran Nair (1974). Chitosan was prepared separately from the shell of head, body and the mixture of those two portions of all the four species of prawns. Viscosity measurements carried out on a 1% solution of chitosan in 1% acetic acid using 'Aimil Emila' Rotary Rheometer.

Table 1. Proximate composition of shell from four species of prawn

Name of species	Portion taken	Moisture %	Ash (dry basis) %	Fat (dry basis) %	Protein (dry basis) %
<i>P. indicus</i>	Head	78.05	20.00	2.35	46.08
	Body	76.27	23.47	2.97	34.63
	Mixture	78.82	20.00	2.56	37.00
<i>M. dobsoni</i>	Head	74.50	21.57	2.50	41.44
	Body	73.96	27.18	3.43	34.65
	Mixture	74.86	18.91	2.95	39.62
<i>M. monoceros</i>	Head	76.15	21.29	3.51	34.82
	Body	76.75	21.00	3.79	31.20
	Mixture	78.15	23.15	3.36	34.04
<i>P. stylifera</i>	Head	81.67	26.08	5.89	31.09
	Body	81.62	30.83	6.98	27.74
	Mixture	82.25	27.92	7.39	28.38

Table 2. Yield and viscosity of chitosan obtained from four species of prawn shell

Name of species	Portion taken	Percentage of chitosan obtained	Viscosity of chitosan in centipoise
<i>P. indicus</i>	Head	4.10	420
	Body	4.70	500
	Mixture	4.30	460
<i>M. dobsoni</i>	Head	2.70	350
	Body	3.48	390
	Mixture	3.00	320
<i>M. monoceros</i>	Head	3.11	190
	Body	3.50	250
	Mixture	3.21	210
<i>P. stylifera</i>	Head	3.10	300
	Body	3.59	350
	Mixture	3.20	340

Results and Discussion

The proximate composition of the prawn shell was determined separately for head, body and their mixture and is presented in Table 1. It shows that there is variation in the protein content of different species of prawn shell. Out of these *P. indicus* shell has the highest protein content (46%). *P. styliifera* shell contains the least protein (27.74%) and maximum fat content (7.39%).

Table 2 gives the yield and viscosity of chitosan obtained from different species and different parts of prawn shell. It is observed further that chitosan obtained from the body shell has the highest viscosity among the individual species and the highest viscosity among the species is found in the case of chitosan from body shell of *P. indicus* and the lowest for that from *M. monoceros*. This is so in the case of chitosan obtained from head waste or mixture of both. Almost similar trend is observed with respect to yield also.

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