

# SHRIMP EXTRACT FROM PRAWN WASTE

\*P. V. PRABHU & A. G. RADHAKRISHNAN

Central Institute of Fisheries Technology, Cochin-682011

A method has been described for the preparation of protein extract from prawn waste. The process consists of extracting the protein from minced fresh prawn head and shell waste by treatment with mild alkali and neutralisation and concentration of the filtrate into a semisolid consistency. The yield of the final product is about 20% of the weight of fresh prawn waste.

## INTRODUCTION

Much work has been done by several workers on the utilisation of prawn head and shell which form the major waste in the prawn processing industry. Kamasa-stri and Prabhu (1961 & 1963) reported the isolation of chitin and glucosamine as well as high quality protein from prawn waste. A method to isolate cholesterol from prawn waste was reported by Kaimal and Rao (1965). Radhakrishnan and Prabhu (1971) studied the conversion of chitin isolated from prawn shell waste into deacetylated chitin viz. chitosan - an industrially important product (Williams, 1959). The present paper describes a method for the preparation of shrimp protein extract from prawn head and shell waste.

It is estimated that in India about 40,000 tonnes of prawn waste is available annually. At present the waste is thrown away or used for converting it

into manure (Ismail *et al.*, 1970). The high percentage of protein present in the waste could be isolated for human consumption or for feeding animals. The method presented in this paper will enable to salvage a good amount of protein which is being wasted now.

## PROCESS

Very fresh prawn head and shell waste collected from the processing factories was used for the studies. It was stored in ice to minimise spoilage before it was processed. The fresh waste was thoroughly washed in potable water and minced in a meat mincer. The minced waste was boiled with 0.5% of its weight of sodium hydroxide for about one hour and the boiled mass was filtered through appropriate stainless steel sieve to remove the shell material. The filtrate was neutralised with hydrochloric acid initially, and with acetic acid towards the end to a pH of 6.8 to 7.0. The acetic acid

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\*Present address: C. I. F. T. Unit, Sassoon Docks, Bombay-5

TABLE I  
Analytical values of shrimp extract  
(Laboratory sample)

|                          |               |
|--------------------------|---------------|
| Colour                   | Grayish brown |
| Moisture                 | 41.84%        |
| Protein (TN x 6.25)      | 39.61%        |
| Ash                      | 9.62%         |
| Fat                      | 6.56%         |
| Acid insolubles          | Negligible    |
| Salt as sodium chloride  | 5.17%         |
| Calcium as Calcium oxide | 1.39%         |
| Phosphorus as $P_2O_5$   | 1.49%         |
| N. P. N.                 | 2.15%         |
| $\alpha$ -Amino N.       | 0.43%         |
| W. S. N.                 | 3.12%         |
| T. V. B.                 | 0.07%         |
| Coagulable - N.          | 0.18%         |
| Proteose N.              | 1.29%         |
| Peptone N.               | 0.39%         |

acts as a preservative too. The neutralised filtrate was concentrated by boiling in a double jacketed stainless steel kettle to obtain a semi-solid mass with a moisture content of about 35 to 40%.

The semi-solid mass was packed in lacquered cans, exhausted and hermetically sealed. The cans were sterilized under 0.7 kg./cm.<sup>2</sup> for 45 minutes and cooled immediately in potable water. After cooling they were wiped, cleaned and stored at room temperature.

The semi-solid mass was also packed in polythene bags and frozen at -40°C and stored at -15 to -18°C.

#### PRODUCT QUALITY

The product was analysed for its

bacterial and biochemical characteristics. Moisture, fat, salt, ash and acid insolubles were determined by the A. O. A. C. methods (1960). Total nitrogen (TN), non-protein nitrogen (NPN), water soluble nitrogen (WSN) and total volatile base (TVB) were determined by microkjeldhal method. Alpha-amino nitrogen ( $\alpha$ -NH<sub>2</sub>N) was estimated by the method of Pope & Stevens (1939). Proteose nitrogen, peptone nitrogen and coagulable nitrogen were also determined (Winton & Winton, 1958). Calcium was estimated as oxalate by permanganometry (Vogel, 1961) and phosphorous by the method of Fiske and Subba Row (1925). Bacteriological analysis was carried out by the pour plate method using appropriate media. Free amino acid content was determined by standard microbiological assay method (Kavanagh, 1963).

#### RESULTS & DISCUSSION

Table I gives the biochemical characteristics of the shrimp extract. The process can be controlled to limit the moisture content to 40% level so that the required consistency is obtained. At this stage, the protein (TN x 6.25) percentage has been found to be about 40%. The proteins are present in a partially hydrolysed form as evidenced by the presence of proteoses and peptones in the product. The product is comparatively rich in phosphorous and calcium. The salt (NaCl) percentage is not too high. Table II gives the analytical report of an imported sample of shrimp extract. The physical and chemical characteristics of the shrimp extract prepared from prawn shell waste compared well with those of the imported sample.

The bacteriological analysis of the canned sample showed that it was sterile. The frozen sample was free from pathogens

TABLE II  
Analytical values of shrimp extract  
(Imported sample)

|                    |               |
|--------------------|---------------|
| Colour             | Bleached grey |
| Moisture           | 33.28%        |
| Total Nitrogen     | 8.17%         |
| N. P. N.           | 3.50%         |
| $\alpha$ -Amino N. | 0.59%         |

and showed only very low total count. The product also contained fairly good amounts of all the essential amino acids as shown in Table III.

TABLE III  
Free amino acid content of shrimp extract  
(Laboratory sample)

|               |           |
|---------------|-----------|
| Histidine     | 0.43 mgm% |
| Lysine        | 1.83 „    |
| Tryptophane   | 0.12 „    |
| Phenylalanine | 3.14 „    |
| Methionine    | 0.93 „    |
| Threonine     | 0.57 „    |
| Leucine       | 1.70 „    |
| Isoleucine    | 0.67 „    |
| Valine        | 0.92 „    |
| Cystine       | Traces.   |
| Tyrosine      | 1.93 mgm% |
| Arginine      | 1.29 „    |
| Glycine       | 1.32 „    |

#### CONCLUSION

A protein concentrate can be obtained from fresh prawn waste by partial hydrolysis of the same with dilute alkali, neutralisation of the filtrate with acid and

concentration by evaporating. The yield is 20% on the basis of the raw material. The product is found to contain partially hydrolysed proteins, minerals and essential amino acids in fairly good amounts. The organoleptic and chemical characteristics tend to suggest that the product should prove to be good from dietary point of view.

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