PROTEIN FROM BLANCH LIQUOR

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A process is described for isolation of edible protein from blanch liquor, which is discarded as a waste at present from prawn canning factories. The protein isolated is colourless and odourless and contains an appreciable amount of salt from the brine used for blanching prawns. It is comparable to fish protein concentrate in amino acid composition.

Introduction

In prawn canning operations the initial brine blanching removes appreciable quantities of soluble proteins from the raw material, which are usually discarded along with the blanch liquor except in cases where the prawn is canned in its own juice. Considering the high turnover of approximately 2200 tons (calculated on the basis of drained weight) of canned prawn in India the amount of proteins thus lost during blanching can be quite substantial. The present study deals with the investigations made on a method of recovery of the proteins from blanch liquor in the form of a powder and on the yield and characteristics of the protein itself.

Materials and Methods

Blanch liquor obtained from prawn canning factories of Cochin was used for the experiment. It was boiled after adding 2 ml of orthophosphoric acid per litre of the liquor, cooled to room temperature and the precipitated protein recovered by filtration through a plate and frame type filter-press comprising of 6 plates of size 466.5 sq cm each at a pressure of 2 kg/cm^2. At the end of filteration, the material was partially dried by forcing air though the filter-press. The press was then released and the material scraped off from the cloth. The recovered material which was of pasty consistency was spread in aluminium trays and dried in a tunnel dryer which took 7-8 hours at 70°C. The dried material was deodourised by the method of Moorjani *et al* (1965). The dry powder was extracted with twice the volume of 95% ethanol at the boiling temperature for 30 minutes. The alcohol was replaced by fresh volume (1.5 times the volume of material) and extraction continued for 30 minutes. This was repeated twice more using equal volumes of 95% ethanol. The resulting powder was free of carotenoid pigments from the prawn meat and was vacunm dried at 70°C for 30 minutes.

The blanch liquor was analysed prior to treatment for total solids, total nitrogen, non-protein-nitrogen and salt as per A. O. A. C. methods. (A. O. A. C. 1960)

Free ∝-amino nitrogen was estimated by Pope and Steven's method (1939). The residue obtained from the filter-press was analysed before extraction with alcohol for moisture, salt and ash. The filtrate obtained from the filter-press was analysed for further precipitable residue (by trichloracetic acid), salt and acidity. The blanch liquor residue after alcohol extraction and vacuum drying was analysed for total nitrogen, non-protein-nitrogen, water-soluble-nitrogen, salt, moisture, ash, calcium, phosphorus and pepsin digestibility by A. O. A. C. methods *(loc. cit.)*. Free ∝-amino nitrogen was estimated by method referred to earlier. Available lysine was estimated by Carpenter's method (1960) and Gross Protein Value calculated by Anwar's formula (1962). Amino acid composition was determined by microbiological methods.

Results and Discussion

The values for total solids, salt, total nitrogen, non-protien nitrogen and free ∝-amino nitrogen of the commercial blanch liquor are given in Table I. In all the blanch liquors obtained from different processing factories, total nitrogenous solids were less than 1.5% and total salt varied from 10 to 12%. The liquor was slightly acidic. Total precipitable matter as determined by 20% trichloracetic acid solution was 1.07%.

TABLE I ANALYSIS OF COMMERCIAL BLANCH LIQUOR

Total solids	: 12.33%
Salt	: 11.15%
Total trichloracetic acid precipitable matter	: 1.07% (on dry weight basis
Total nitrogen	: 252.00 mg%
Non-protien-nitrogen	: 36.25 mg%
Free ∝-amino nitrogen	: 6.30 mg%
Acidity	: 0.14ml of 0.1N NaOH/ml.

The maximum amount of protein that can be precipitated was found to be 0.91% on dry weight basis and the amount of orthophosphoric acid required for this was 1.8 ml per litre of blanch liquor. Filteration without boiling was found to be difficult due to the highly colloidal nature of the solution. But on acidification and boiling the colloids were coagulated and by employing the filter-press, satisfactory filtration rate was obtained. It was also noted in the course of the experiments that when the liquor was kept overnight after precipitation of the protein, the precipitated protein again went into solution. Further acidification and boiling were necessary for recovery of the residue. The residue obtained from the filter-press was highly pasty in consistency and pink in colour due to the carotenoid pigments of prawns. It was acidic and had moisture content of 80.90%, ash: 4.99% and salt: 3 94%. Total precipitable matter by trichloracetic acid in the filtrate from the filter-press was 0.056% and salt 9.45%.

The wet protein isolate was stable at room temperature for several hours without any deterioration probably due to the slightly acidic nature and salt content. On drying in a tunnel dryer at 70°C, it gave a light brown product. Repeated extraction of the residue with 95% ethanol removed the carotenoid pigments and fishy odour completely. The vacuum dried product was colourless after powdering. The analytical values of this powder for moisture, total nitrogen, non-protein-nitrogen, free ∝-amino nitrogen, water-soluble-nitrogen, ash, calcium, phosphorus, pepsin digestibility and available lysine are given in table II. The product had an available lysine content of 6.76g/16g N compared to a value of 8.20 g/16 g N in the case of fish

TABLE II ANALYSIS OF PROTEIN ISOLATE

Moisture	:	2.44%
Total Nitrogen	:	99.60 mg%
Protein (T. N. X 6.25)	:	62.26%
Non-protien-nitrogen	:	10.00%
Free ∝-amino nitrogen	:	1.79 mg%
Water-soluble-nitrogen	:	13.03 mg%
Ash	:	36.23%
Salt	:	34.13%
Calcium	:	8.37 mg%
Phosphorus	:	737.60 mg%
Iron	:	Traces
Pepsin degestibility	:	94.26%
Available lysine	:	6.76 g/16 g N.

TABLE III AMINO ACID COMPOSITION
g/16 g N.

	Blanch liquor protien isolate	Fish protein concentrate
Aspartic acid	9.8	10.1
Arginine	5.6	6.9
Alanine	6.3	6.8
Glutamic acid	15.8	16.6
Glycine	6.9	4.2
Histidine	1.1	2.5
Leucine	6.8	7.7
Isoleucine	4.2	3.9
Lysine	8.9	9.5
Methionine	3.9	3.2
Phenylalanine	4.6	4.1
Proline	5.4	3.8
Serine	3.7	4.2
Threonine	2.5	3.8
Tyrosine	2.7	2.1
Tryptophan	0.4	0.7
Valine	5.5	5.1

protein concentrate prepared in our laboratory. The Gross Protein value of the powder was found to be 118.3. The amino acid composition of the product as determined by microbiological methods is given in table III. The values showed more or less close agreement with those of fish protein concentrate as seen from the table.

Summary

Blanch liquor, usually discarded from prawn canning factories can be utilised as a source of digestible protein. The protein is odourless, colourless and saltish in taste. It is comparable to fish protein concentrate except for its high salt content. It contains less minerals than fish protein concentrate. The isolate can be used as a source of dietary protein and can be used for enrichment of protein in processed foods, baked foods and cereal flour.

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