Pakistan J. Sci. Ind. Res., **12**, 49–51 (1969)

STUDIES ON BLANCHED WATER—A WASTE PRODUCT OF THE SHRIMP CANNING INDUSTRY

S. Abdul Haq, Iqbal H. Siddiqui and A. Hameed Khan

Division of Biochemistry, P.C.S.I.R. Laboratories, Karachi 32

(Received February 8, 1968)

The blanched water rejected by the local shrimp canning industries contain 16% protein and nearly 78% sodium chloride. It has been observed that during the blanching operations in the shrimp canning industry, the total leaching losses of protein, free amino acids, minerals and vitamins, range from 30,000–60,000 lb during an 8-hr shift, depending upon the size of the blanching vessel. Using dialysis in static water it is possible to recover 80% of the salt and to concentrate 60% of the proteinous matter which was otherwise going waste.

Introduction

Many fresh foods are given a hot water or steam scald, known as the *blanch*, before filling in to the container. This serves to remove surface materials which might affect the flavour, drives out gas, and wilt the product so that a better control of the fill is possible. Blanching reduces the amount of colour change by removing air volatile as well as water soluble constituents.[1] It also helps in destroying enzymes,[2] but resulting at the same time in an appreciable loss of ascorbic acid[3–5] and carotene. Some processors[6] have determined a leaching loss of 5 to 10% of the total water soluble vitamins or other constituents during blanching. These losses may go up to 50% depending upon whether the blanching is done in water or in steam. Losses are higher in water than in steam blanching.[7] Quick-high-temperature blanching has now been adopted by most of the industries resulting in an improvement of the colour of the product.

Shrimp canning is a very flourishing industry in Pakistan. None of these industries, however, is paying any attention in conserving the loss of precious nutrients during blanching. It has been observed that in the blanching operation in the shrimp canning industry, the total leaching losses of protein, free amino acids, minerals and vitamins, ranges between 30,000 lbs to 60,000 lbs, during an 8-hr shift, depending upon the size of the blanching vessel.

Since at the moment the whole of this nutritious material is drained off and not much literature is available in the field of blanching of shell fisheries, the present study was undertaken in order to give an incentive to the shrimp canning factories for the recovery of this important waste. The industrial aspect of this waste is still under investigation and will be dealt with in a separate communication.

Experimental

Blanching.—Blanching is generally done in an apparatus called *blancher* (Fig. 1). It consists of a rectangular stainless steel tank 'A' suitable to resist corrosion, having a stainless steel coil 'D' for heating. A hanging stainless steel trough, 'B' having perforated bottom and sides, contains the food stuff to be blanched. The perforated trough can be mechanically operated with the help of pulleys 'C'.

At the shrimp canning factory at Karachi, the blanching is done, by boiling the fresh, deshelled, washed and graded shrimps in salt solution in a stainless steel blancher for 10–15 min till the product develops pinkish colour and the adhering impurities are removed. The blanched shrimps are removed from the tank mechanically, and the milky blanched water is discarded. It is this water which was used in the present investigation as a starting material.

The water was transferred to an evaporating dish and allowed to dry on a boiling water bath. The final drying of this material was done in a hot air blowing oven. The dried material thus obtained was ground to 40 mesh in a ball grinder. It was found to have the following composition:

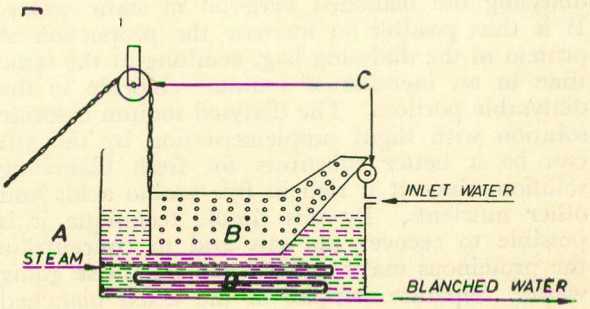

Fig. 1.—Blancher.

Protein 16.16%; Fat 0.1%; sodium chloride 78.42% and ash 81.00%.

Dialysis.—Different samples (100 g each) of the dried blanched material were transferred to 4 different dialysing tubes. Each tube was subjected to dialysis in 1000 ml distilled water, for 2, 4, 6 and 8 hr at room temperature on a magnetic stirrer. The dialysed and the non-dialysed materials were collected and analysed for their nitrogen and sodium chloride contents. The results are given in Table 1.

Dialysis in running water was conducted in an identical manner by suspending the dried blanched material in dialysing tubes in running tap water at room temperature. The rate of separation of protein and sodium chloride is shown in Fig. 2.

Paper Chromatography.—To understand the amino acid make up of the nondialysable portion it was hydrolysed with 6NHCl and submitted to two-dimensional paper chromatography using butanol: Acetic acid: water (100:22:50) and phenol: water (80:20). The paper showed the presence of the following amino acids: aspartic acid, glutamic acid, serine, glycine, alanine, phenyl alanine, lysine, histidine, arginine, tyrosine, leucine/isoleucine. Tryptophane appears to have been destroyed during acid hydrolysis and was not detected.

Results and Discussion

The blanched water rejected by the local shrimp canning industries contained 16.16% extracted protein and nearly 78.42% sodium chloride. Since the amount of sodium chloride is high the isolation of protein from blanched water could only be done effectively through dialysis. It is evident from Fig. 2 that dialysis in running water will result in a loss of sodium chloride which could otherwise be recovered and used again. This loss could be overcome by dialysing the blanched material in static water. It is thus possible to increase the proportion of protein in the dialysing bag, resulting at the same time in an increase of sodium chloride in the dialysable portion. The dialysed sodium chloride solution with slight supplementation by the salt can be a better substitute for fresh blanching solution, since it is rich in free amino acids and other nutrients. By this simple technique it is possible to recover the salt and to concentrate the proteinous matter which was otherwise going waste. Separate samples of the dried blanched material were dialysed for different times and as is evident from Table 1, 4-hr dialysis is sufficient to concentrate protein and to dialyse out nearly 80% of the salt.

To overcome losses of valuable nutrients by water or steam blanching, considerable research has been conducted to develop electronic blanching, which would avoid losses through leaching, but a satisfactory procedure has not, as yet, been worked out. Similarly exposing the food to sulphur dioxide[6] or dipping the food in a liquid containing a similar substance has also been tried. The sulphite protects colour and flavour of the food by combining with the enzymes and inhibiting them. The greatest drawback in such a treatment is that the chemical disappears gradually during storage and the protection is lost. Moreover, sulphite gives a flavour which may be objectionable to the consumer. Use of radiation has not been legally permitted.[6] In view of the above mentioned facts, and in spite of the losses of valuable nutrients through leaching, water blanching is still preferred.

Due to certain experimental difficulties quantitative determination of the amino acids was not undertaken. It was, however, noted that glycine was present in exceptionally high amounts, a fact which has also been observed by Simidu and Hujita, and the peculiar taste of shrimps has been attributed to the abundance of this amino acid.[8] Since crustacean muscles are reported to be defi-

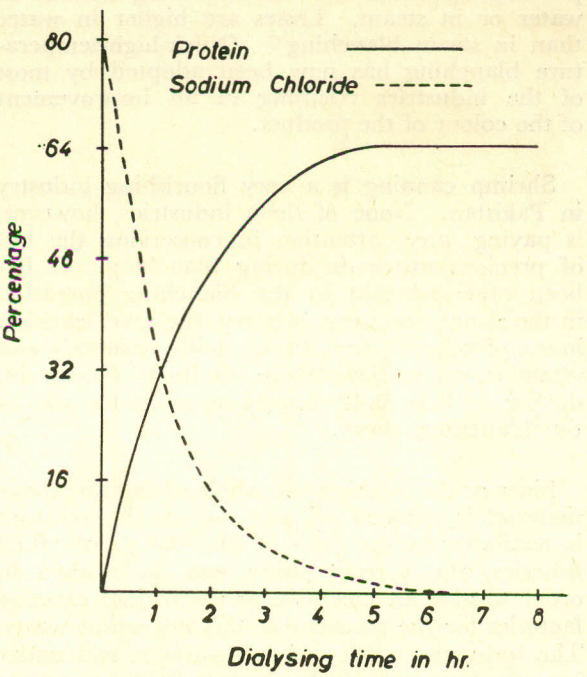

Fig. 2.—Dialysis of dried blanched material in running tape water.

TABLE 1.—DIALYSIS OF DRIED BLANCHED MATERIAL (100g) IN STATIC WATER AT ROOM TEMPERATURE.

Sample No.	Dialysis time hr	Nondialysable portion				Dialysable portion			
		Yield g	Protein %	NaCl %	Total ash%	Yield g	Protein %	NaCl %	Total ash%
A	2	23.01	44.40	10.20	59.90	75.37	4.77	68.80	86.00
B	4	8.40	63.18	0.68	34.40	91.40	6.56	81.00	85.40
C	6	8.05	63.72	0.07	37.80	92.60	6.62	82.80	86.70
D	8	7.04	64.31	0.00	32.10	93.00	6.75	88.40	82.70

cient in cystine and cysteine, we also did not find these two amino acids in the hydrolysates.[9]

Acknowledgement.—The authors are indebted to Dr. Ahmad Kamal, Director, P.C.S.I.R. Laboratories, Karachi for his encouragement throughout this work. Thanks are also due to M/s. A.G. Fisheries, Fish Harbour, Karachi, for cooperation and supplying the raw material for the present study.

References

1. G. Machiney and C.A. West, Ind. Eng. Chem., **32,** 392 (1940).
2. *The Chemistry and Technology of Food and Food Products*, edited by M.B. Jacobs, (Inter Science Publishers, New York 1951), second edition. Vol. III pp. 1867.
3. E.F. Kohman, Food Res., **7,** 49 (1937).
4. Lee, A. Frank and W. Joanine, New York Agri. Expt. Sta. Geneva, Food Research, **10,** 465 (1945).
5. M. Oliver, Food Res., **7,** 48 (1937).
6. *The year book of Agriculture*, Washington D.C. (1959) pp 420.
7. Chem. Abstr., **33,** 2603 (1939).
8. W. Simidu and M. Hujita, Bull. Japan. Soc. Sci. Fisheries, **20**(8), 720 (1954).
9. *Fish as food*, Vol. 1, edited by G. Borgstron. (Michigan University, New York and London, 1961) pp. 370.