NOTE II

ON THE MEASUREMENT OF CONCENTRATION OF BLANCHING BRINE BY ELECTRICAL CONDUCTIVITY METHOD

Blanching is an important operation in the shrimp canning process, in order to bring down the moisture content of the product to the required level, to allow the proteins to coagulate and to give proper texture, shape and characteristic pink colour to the meat.It has been observed that among other factors responsible for fluctuations in the drained weight in the canned prawns, concentration of brine used for blanching and the duration of blanching are important. (Varma, Chaudhury and Pillai 1961).

Under normal conditions in the Cochin area, about 10 to 15 Kg. of prawn pulp taken in stainless steel mesh baskets are cooked by dipping in hot brine of concentration ranging from 5 to 12 % and containing 0.2% citric acid, taken in stainless steel lined tanks, which are heated by steam coils. The blanching time varies from 4 to 12 minutes depending on the species, size grade of prawn and the concentration of the blanch liquor.

For economy, the same blanch liquor is reused for successive blanchings, each time making up the concentration to the original level manually through guess work. There are no rapid methods/devices available indigenously for continuous monitoring of the brine concentration to the required level, for the fishing trade. The normal method of estimation of salt concentration is by analytical method which is time consuming and requires a skilled technician to do the job and is also not suitable on the processing line. (AOAC 1960). Hence studies were taken up at the Institute to develop a suitable device for on the spot measurement of salt content of blanch liquors.

The instrument designed for the purpose is similar to the one designed by the author earlier, for the measurement of salt content in dry fish by electrical conductivity method with some modifications (Rao *et al* 1971). The instrument fabricated for this purpose is calibrated in the salt concentration range 5 to 12% (containing 0.2%) citric acid at 98°±2°C taking into consideration the conductivity errors caused by the dissolved proteins/salts leached from prawns into the blanch liquor.

The electronic part of the instrument consists of a low power wien bridge oscillater operating at 2.3K Hz and driving a class B push pull amplifier. It is followed by a bridge circuit of which the test cell dipped in the blanching tanks forms an unknown resistance and a detector stage of a two stage amplifier and an output meter. The frequency stability of the oscillator is better than 5% and variation in amplitiude is ± 2% at low and high peak loads. The unit is fed by a constant 6.2V. D. C. through a zener diode.

The test cell consists of two platinum eloctrodes seperated by a distance of 50 mm

TABLE I

Effect of temperature on the conductivity measurements of blanch liquor of concentration 9% containing 0.2% citric acid

Temperature of brine	% salt concentration read on the meter scale	Error %
92°C	8.5	0.5
95°C	8.7	0.3
99°C	9.0 (Nearly)	very low

TABLE II

Effect of dissolved proteins on conductivity values of brine at 30°C

Frequency of measurement	A. C. Resistance of Blanch liquor having 5% NaCl	5% NaCl Solution
16 KHz	36.5 Ohm	42.5 Ohm
10 KHz	37.0 ,,	43.0 ,,
1 KHz	41.0 ,,	47.0 ,,
	Blanch liquor having 7% NaCl	7% NaCl solution
16 KHz	28.0 Ohm	33.0 Ohm
10 KHz	29.0 ,,	33.5 ,,
1 KHz	34.0 ,,	37.5 ,,

and having a cell constant of 3.93. The cell assembly has been so designed such that the electrolyte under measurement is isolated from the rest of the liquid and is unaffected by the conducting materials in the vicinity.

The instrument is cailbrated initially using known concentrations of ANALAR grade sodium chloride solutions with 0.2% citric acid in the range 5 to 12% w/v at 98° ± 2°c.

The temperature effect on the calibration of the instrument was studied as it was noticed that the temperature of the blanch liquor varied from 96° to 100°C during the process. The results are given in Table 1.

TABLE III

Trials on measurement of concentration of blanching brine by Electrical Conductivity method

No. of blanching	% Salt Concentration obtained from Meter	Chemical analysis	Error
6th Blanching	7.5	7.21	—0.29
7th ,, (before addition of salt)	7.2	6.56	—0.64
7th Blanching	7.5	7.24	—0.26
8th ,, (before addition of salt)	7.1	6.6	—0.50
8th ,,	7.5	7.24	—0.21
9th ,, (before addition of salt)	7.1	6.66	—0.44
9th ,,	7.4	7.24	—0.16
10th ,, (before addition of salt)	7.2	6.51	—0.69
10th ,,	7.4	7.00	—0.4
11th (before addition of salt)	7.2	6.69	—0.51
11th ,,	7.3	6.93	—0.37
12th ,, (before addition of salt)	7.1	6.75	—0.35

It could be seen that a drop of 5°C in the blanch liquor corresponds to a maximum error of 0.3% in the concentration at 9 % level on the calibrated scale which is not high for routine measurements.

Experiments on the effect of dissolved proteins on the electrical conductivity measurements carried at audio frequencies have revealed that the conductivity of the pure salt solution is increased by 15 to 17% at 16K Hz by the soluble proteins. This corresponds to approximately showing salt concentration 1.2% to 1.3% (at 30°C) higher than what is actually present.

But it had been found that this error was proportionally less at elevated temperatures and is fairly constant irrespective of protein concentration due to repeated blanchings.

The equipment had been tested for repeated blanchings upto 15 for various

salt concentrations in the range 7to 10% at the local canning factories.

One such typical data is given in Table III along with the values obtained from standard AOAC methods.

It could be seen that the mean error read by the meter is within 0.4% on the average of the calibrated scale at 7% level due to proteins leached out from the prawns.

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Cochin

C. V. N. RAO[1]
P. V. PRABHU[2]

1. Central Institute of Fisheries Technology, Cochin.

2. Central institute of Fisheries Technology Unit, Bombay.

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