PRELIMINARY STUDIES ON BLANCHING OF PRAWN

D. R. CHAUDHURI & K. K. BALACHANDRAN
Central Institute of Fisheries Technology, Ernakulam

[The paper represents results on the studies undertaken to find out the causes of irregular drained weight conditions in commercial canned prawn samples. The tendency of cooked prawn to attain the equilibrium moisture content (72 — 74% — in *M. affinis* and *M. dobsoni*) when in contact with brine has been found to be mainly responsible for the loss and gaine in drained weight. Underblanching results in loss of moistures from the meat during processing.

It has been found that under standard blanching conditions, which is independent of initial moisture content, salt concentration of the blanch liquor and the temperature of sterilisation, the fluctuation in the drained weight could be avoided.]

Introduction

General survey of the data on commercially canned prawns shows a wide range of drained weight — overfilled and underfilled. In most cases this happens due to imperfect blanching conditions.

Blanching is one of the most important steps in the canning of prawn. It is essential in order to bring down the moisture content of the prawn to the required level, to allow the proteins to coagulate and to give proper firmness and shape to the meat. On blanching the carotenoid pigments (Wood, 1951) tetraxanthin and / or astaxanthin present in the prawn are released and these provide characteristic colour to the product depending upon the species.

As blanching upsets the normal moisture level of the prawn it is bound to bring in changes in the weight also. It is, therefore, natural to expect a greater weight loss when the blanching procedure is prolonged or when the salt concentration is increased and a lesser weight loss when the blanching period is short and the concentration of salt is low. Prawns canned in brine, undergo a second stage of cooking in presence of brine during the sterilization process. Unless the blanched prawn has the optimum moisture level drastic changes in the weight of the prawn may take place during the sterilization period. Canners usually add additional quantities of material to the can in order to compensate for possible ossles as mentioned above. However, this is purely arbitrary and may not, at all times, give the desired results. In this connection it is also to be noted that in an underblanched prawn the protein may not fully coagulate with the result that during sterilization loose protein particles may be solubilised in brine making it appear highly colloidal. All this would mean that for successful canning of prawn vis-a-vis maintenance of correct drained weight it is necessary to know the optimum blanching conditions.

Investigations were carried out to fully standardize and perfect the principles and technique of blanching of prawn. The results obtanied in the preliminary studies are presented in the paper.

Method

Fresh prawns obtained from the Institute's fishing boat was used all throughout the experiment. The species used for the purpose were *Metapenaeus dobsoni* and *M. affinis*.

TABLE — 1

EFFECT OF SALT CONCENTRATION AND TIME OF BLANCHING ON THE FINAL MOISTURE CONTENT AND DRAINED WEIGHT OF MEDIUM SIZED PRAWNS

	Blanching		Blanched product		Processed product		Conc. of filling brine (%)		Filled wt. (g)	Drained wt. (g)	Nature of brine
	Salt conc. (%)	Time (min.)	Moisture (%)	Salt (%)	Moisture (%)	Salt (%)	before processing	Alter processing			
1.	4	3	73.5	1.11	72.3	4.16	3	1.94	142	133	Very turbid & colloidal.
2.	4	5	73.0	1.26	72.5	4.25	3	2.08	142	139	— do —
3.	4	7	70.7	2.14	72.3	4.45	3	2.36	142	146	Slightly turbid
4.	5	5	69.0	2.97	72.0	4.8	3	2.49	150	158	Clear
5.	5	7	68.3	3.24	72.0	4.9	3	2.50	150	161	Clear
6.	5	9	65.0	3.53	72.0	5.47	3	2.78	150	164	Clear
7.	7	3	73.0	4.5	72.2	5.17	3	2.40	150	140	Clear
8.	7	5	72.8	5.7	72.5	6.8	3	2.89	142	142	Clear
9.	7	7	70.5	3.8	72.2	4.6	3	2.37	150	157	Clear
10.	7.5	3	71.3	3.82	72.05	5.7	3	2.65	142	141	Turbid
11.	7.5	5	69.3	5.00	72.6	5.8	3	3.7	142	151	Clear
12.	7.5	7	69.0	5.63	72.0	6.1	3	3.2	142	154	Clear
13.	7.5	10	67.9	7.6	72.5	7.1	3	3.55	142	161	Clear
14.	10.0	3	73.0	6.8	72.2	7.15	3	2.89	142	133	Highly colloidal
15.	10.0	5	71.25	9.6	72.3	8.5	3	2.6	142	152	Clear
16.	(water)	5	73.1	—	72.0	6.00	4	1.86	150	150	Turbid

Whole prawn 5″ — 6″ in length is considered 'medium' and 3″ — 4″ as small in the paper.

After proper cleaning the prawns were blanched in brain either by changing the concentration of brine or by varying the time of contact. Blanched pawns were then immediately cooled and canned in 3% brine as the filling brine in the presence of 0.1% citric acid.

The cans thus prepared were examined for drained weight and the turbidity of the filling brine.

Result and Discussion

Moisture content of the prawn tissue decreases with the time of blanching until the shrinkage is complete. Initial moisture content of peeled and deveined prawn comes down to 74-75% in three minutes of blanching irrespective of the concentration of brine but further reduction depends on the concentration of brine as indicated in Table I. For example, the moisture content of the blanched prawn will come down to about 71%, 71-72%, 72-73% with 10%, 7% and 5% brine concentrations respectively, in five minutes. Further reduction in the moisture content also takes place very slowly and becomes constant at about 65-66% moisture level.

It is evident from Table I that the sample blanched for 3 minutes gives highly turbid filling brine in the processed can with the simultaneous reduction in drained weight. Samples blanched in 4% or 5% brine for 5 minutes gives turbid brine after processing but when blanched in brine of 7% concentration or above for 5 minutes gives very clear filling brine. The drained weight is almost the same as or more than the filled weight. Blanching the prawns for longer periods in higher salt concentrations gives the clear filling brine with the simultaneous increase in drained weight and the salt content of the tissue. On the other hand blanching prawns in lower brine concentrations for shorter periods results in the simultaneous reduction in the drained weight of prawns and the salt concentration of filling brine. Moreover the filling brine becomes turbid.

In order to have the proper drained weight, moisture content of the blanched material and the equilibrium moisture (i.e. the moisture content of the prawn after sterilization) content should almost be identical as indicated in Table I.

The blanching time for the medium sized prawns in 7% brine may be taken as 5 minutes as it gives correct drained weight, proper salt concentration (5-6% on dry weight basis) of the tissue. Moreover the product gives clear brine.

The most important and characteristic feature observed, from the Table I is the equilibrium moisture content of the tissue — which is almost constant at about 72% moisture level. Further studies indicate that the equilibrium moisture content of the prawn tissue also depends on the size of the prawn and it is 74% with the smaller size of the prawn, Tables II and III.

The effect of initial moisture content of the prawns on the final equilibrium moisture (eq. M.) content of the prawn tissues has also been studied and it has been observed that the initial moisture level has no effect on the Eq. M. content of the prawn tissue — as indicated by Table II.

Table III shows that Eq. M. is independent of salt concentration and the temperature of sterilization. Longer blanching time in brine increases the salt uptake of the tissue but it does not affect the Eq. M. content of the tissue as no osmotic equilibrium is established between the salt content of the filling brime of the salt retained by the tissue but the amount of salt coming out from the tissue after blanching in water is relatively more than in the case of brine-packed prawns after sterilization as indicated by Table IV. The amount of salt released under diffierent cooking conditions is also represented in Table IV.

There is no appreciable release of salt after 20 minutes cooking at 10 p.s.i. but no osmotic equalibrium is established between the salt concentation of the tissue and the brine solution used for canning. So the salt retention and release from the tissue may be regarded as a physical phenomenon.

TABLE – II

EQUILIBRIUM MOISTURE CONTENT OF SMALL SIZED PRAWN AFTER BLANCHIN AND STERILIZATION

Blanching		Moisture content (%) after blanching	Moisture content (%) after sterilization at 10 p. s. i. for						at 13 p. s. i. 90 min.
Salt conc. (%)	Time (min.)		20 min.	30 min.	40 min.	50 min.	60 min.	70 min.	
7	3	72.95	74.51	74.2	74.2	...	74.38	...	74.25
7	4	72.94	74.6	74.13	74.19	74.66	74.60	74.46	74.86
7	5	72.00	74.05	74.12	74.20	74.51	74.30	74.28	74.65
10	3	74.2	74.32	...	74.08	74.25	...	74.5	...
10	7	69.42	74.06	74.2	...	74.65	74.5	74.2	74.20
10	10	68.25	74.03	...	74.6	74.09	...	74.5	...
10	15	68.18	74.08	74.2	74.4	...	74.3	...	74.15

It can be concluded that once denaturation is complete, Eq. M. content of the tissue remains unaffected by cooking time, temperature and by the initial moisture content of the sample. Ordinary autoclaving conditions are sufficient to bring about the complete denaturation of prawn tissue. The presence of salt or other chemicals may only enhance the rate of denaturation.

TABLE III

EQUILIBRIUM MOISTURE CONTENT OF RAW, BLANCHED IN WATER SMALL SIZED PRAWN AFTER STERILIZATION

Condition of Prawns			Moisture content (%) after sterilization at 10 p. s. i. for					
Raw	Blanched in water (min.)		10 min.	20 min.	30 min.	40 miu.	50 min.	60 min.
	3	5 7						
Do			74.02	74.05	74.1	74.2	74.5	74.19
	Do.		74.06	74.1	74.5	74.2	74.3	74.2
		Do.	74.09	71.15	74.02	74.1	74.2	74.2
		Do.	74.1	74.2	74.5	74.08	74.3	74.09

TABLE IV

RATE OF SALT RELEASE WITH COOKING TIME

Salt conc. (%)	Blanching time (mins.)	Time of cooking 19 p. s. i. (mins.)	Amount of salt released from 25 gm. blanched prawns when packed in water (g)	3% brine
7	4	20	0.50	0.154
7	4	30	0.55	0.22
7	4	40	0.551	0.22
7	4	50	0_3552	0.22
7	4	60	0.553	0.22
7	4	70	0.552	0.22

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Reference

1. Wood, T.W., *Carotenoids in Fish*, Cambridge University Press, (1951).