Prediction of Drained Weight of Canned Prawn Under Laboratory Condition

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A workable formula for calculating the drained weight of canned prawn under laboratory condition of blanching and processing has been worked out with two variables, namely, concentration of blanching brine and time of blanching. The accuracy of the results is within $\pm 2.0\%$. The suggested formula is applicable only under specified conditions of canning.

Fluctuation in drained weight of canned prawn produced under commercial conditions of processing is quite common in India. The extent of variations may go as high or as low as 15 to 20 g over the declared weight. Production of canned prawn being entirely export oriented, cans detained due to short weight condition would not even find proper internal market. To avoid the risk, processors usually add some extra amount of meat on an arbitrary basis in each can. This arbitrary method of addition of prawn also mean a colossal national loss (Varma *et al.*, 1969).

So far, no effort has been made to work out a general formula to calculate the drained weight of canned prawn with reasonable accuracy under standard condition of blanching, packaging and processing. An attempt has been made in that direction and a general formula is suggested for the prediction of drained weight of canned prawn under laboratory conditions.

Materials and Methods

Metapenaeus monoceros of 8–10 cm length was employed in the study. Blanching was carried out with an electric heater and in every case the blanching time was counted as soon as reboiling started. The specification used for the standard pack of prawn was that of Varma *et al.*, 1969 (128 g of blanched prawn and 90 ml of 3.0% brine containing 0.1% citric acid). Moisture content of blanched meat at different concentrations of brine and time of blanching was determined by the method of AOAC (1965).

Results and Discussion

The drained weight of a can is dependent upon moisture content of blanched meat which is again dependent upon time of blanching, concentration of salt in blanching liquor, size of prawns and method of cooling after blanching (Varma *et al.*, 1969; Chaudhuri & Balachandran, 1965).

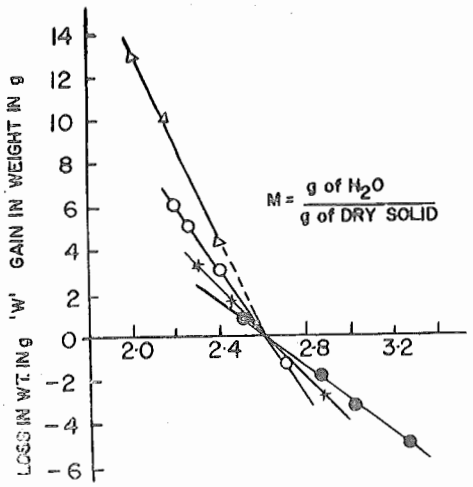

Fig. 1. *Plot of 'W' Vs 'M'*
Blanching brine concentration
●—● 5%; ×—× 7%;
○—○ 10%; △—△ 15%

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Experiments were performed under standard condition to note the variations of drained weight with particular reference to the moisture content of blanched meat at different levels of concentration of salt in blanching brine (5%, 7%, 10% and 15%) and time of blanching. Fig. 1 shows that when graphs were drawn taking variations of drained weight (W) as ordinate against the moisture content of blanched meat, expressed as gram of water per gram of dry material (M) as abscissa, straight lines were obtained in each case. All the straight lines passed only through the point 2.62, namely, 72.4% moisture (on wet basis) showing that the moisture content of meat after thermal processing is a fixed value with particular relation to the species of prawn.

The equations for the above straight lines thus obtained are as follows:

For 5% blanching brine
$W = -7.39\ M + 19.36$ (i)

For 7% blanching brine
$W = -10.3\ M + 27.0$ (ii)

For 10% blanching brine
$W = -14.4\ M + 37.73$ (iii)

For 15% blanching brine
$W = -21.3\ M + 55.8$ (iv)

These equations are of the form
$W = m\ M + C$ (v)

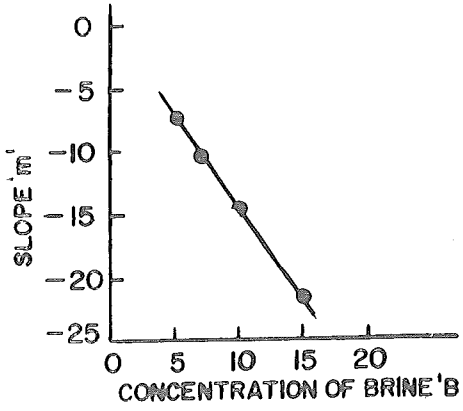

Fig. 2. *Plot of 'm' Vs 'B'*

The relation between individual slopes 'm' and intercepts 'c' of the different lines with concentration of blanching brine 'B' was obtained from Fig. 2 and Fig. 3 respectively.

$m = -1.44\ B$ (vi)

$C = 3.8\ B$ (vii)

Substituting the values of 'm' and 'C' in equation (v) we get

$W = -1.44\ B\ M + 3.8\ B$

$= B(3.8 - 1.44\ M)$ (viii)

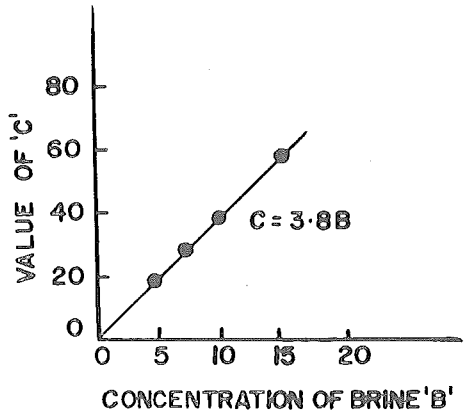

Fig. 3. *Plot of 'C' Vs 'B'*

Where,

W = fluctuations of drained weight against the standard pack of 128 g of blanched meat.

M = moisture content of blanched meat expressed as g of water per g of dried material

B = concentration of blanching brine as g/100 ml

The equation (viii) may be utilized to predict the fluctuations of drained weight (W) provided 'M' and 'B' values are known under the specified conditions of blanching, packaging and processing.

The effect of time of blanching and concentration of blanching brine on moisture content of meat was determined experimentally. It was observed that the change in moisture content of meat with time follows a hyperbolic relation (Fig. 4) at

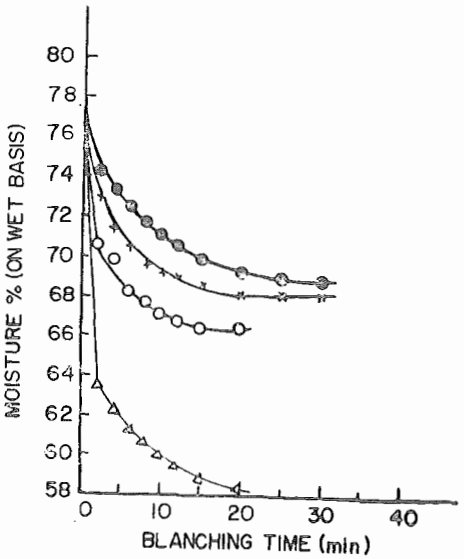

Fig. 4. *Plot of moisture % Vs time*
●—● 7%; ×—× 10%;
○—○ 15%; ▷—◁ 25%

different concentrations of blanching brine. Since the hyperbolic relation when plotted in log-log plot (Fig. 5) gives a straight line, the general equation therefore may be of the following form

$$M = AT^{K} \qquad \text{(ix)}$$

Where,

M = moisture content of blanched meat, expressed as g of water per g of dry material

T = time of blanching in minutes

A, K = constants

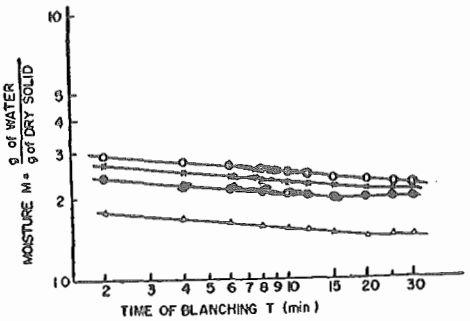

Fig. 5. *Plot of log 'M' Vs log 'T'*
○—○ 7%; ×—× 10%;
●—● 15%; ▽—▽ 25%

The experimental values of M and T at different concentrations of blanching brine were substituted in equation (ix) and the equations thus obtained were solved simultaneously and the mean values of 'A' and 'K' are given in Table 1.

By plotting the values of 'A' as ordinate against the respective values of concentration of brine 'B' as abscissa (Fig. 6) the following relation was obtained.

$$A = -0.067\ B + 3.562 \qquad \text{(x)}$$

Hence the equation (ix) takes the form

$$M = (3.562 - 0.067\ B)\ T^{-0.11} \qquad \text{(xi)}$$

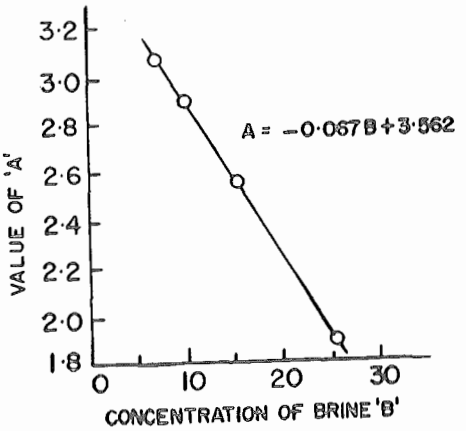

Fig. 6. *Plot of 'A' Vs 'B'*

Table 1. *The mean values of 'A' and 'K' at different brine concentrations of blanching liquor*

Brine concentration % B	A	K
7	3.075	– 0.11
10	2.892	– 0.11
15	2.550	– 0.11
25	1.892	– 0.11

Substituting the value of M in equation (viii) the equation of the following form is obtained.

$$W=[3.8-(5.13-0.096\ B)T^{-0.11}]\ B \quad \text{(xii)}$$

From the equation (xii) 'W' can be calculated provided the values of T and B are known. Calculated and experimental values of drained weights (Table 2) show a good correlation justifying the validity of the equation. This may also be applied to commercial system of blanching by steam with modification of the formula (ix).

Table 2. *The calculated and observed drained weights under standard conditions*

Time of blanching min	Concentration of blanching liquor %	Actual gain/loss in weight in g over the std. pack=Ac	Calculated gain/loss in weight in g=Ca	Error % E=Ca–Ac/128
3	5	– 1.54	– 0.580	0.75
12	5	+ 3.20	+ 2.190	0.78
5	7	+ 3.81	+ 1.764	1.59
15	7	+ 6.60	+ 4.585	1.57
4	10	+ 6.30	+ 4.000	1.80
12	10	+ 9.95	+ 7.870	1.62
5	15	+15.10	+13.020	1.62

References

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