

Processing Clam Meat into Pickles

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Methods have been worked out for the production of pickles from clam (*Velorita* sp.) meat. The bacteriological quality of the clam meat at different stages of processing was studied. The clam pickles packed in glass bottles and sealed air tight remained in good condition for six months at ambient temperatures.

Clam is a bivalve found in large quantities in brackish water lakes, estuaries and bar mouths. In Kerala, Vembanad lake is known to be the richest source of clams. Ashtamudi lake and several other inland water bodies abound in clams. Clam fishery of Kerala predominantly is centered round two species, *Velorita* and *Meretrix*. Clam is generally fished for its shell which is a very important raw material in several industries like cement, calcium carbide and lime. Clams are collected and heaped in the open to allow the meat to decay and thus to get rid of it except in few cases where it is boiled, the meat shucked out and sold in the areas nearby.

Clam on cooking and shucking yields an average of 9% meat. It has been roughly estimated that about 2400 tonnes of clam meat is available from Vembanad lake alone (Sebastian, 1970). This together with its availability from several other sources contribute to a substantial quantity. The fact that only a negligible portion is utilised for food purposes tells the story of the wastage of a nutritious food.

Clam meat is rich in protein, tasty and is relatively high in glycogen, similar to prawns and crabs. However, no attempt is made to process it to stable products to prevent wastage. Venkataraman & Chari (1951) studied the seasonal variation in chemical composition of clam meat. Sebastian (1970) has given an account of canning clams. Balachandran & Nair (1975) worked out a method of depuration and its canning.

Clam meat renders itself well for processing into pickles by low cost technology and

can be taken up by the rural people economically where clams are fished in large numbers and will provide employment for many. Hence this study on pickling of clam meat has been taken up.

Materials and Methods

Clams (*Velorita* sp.) were collected from the Vembanad lake near Vaikom in Kerala. After washing free of mud and sand in the lake water, the clams were allowed to starve for 24 h in clean lake water for depuration followed by keeping them in chlorinated (5 p.p.m.) water for 2 h in order to get rid of the sand in the stomach. Clams were steamed until they opened the shell and the meat was shucked out by hand. The meat was pickled in two ways, fresh and also after blanching in boiling brine of 5% strength for 8 min. Of the several recipes tried, two were found organoleptically more suitable based on shucked meat as such, as well as after blanching in brine.

Ingredients used in the preparation of pickle using shucked clam meat was as follows:

1. Clam meat shucked	1000 g
2. Mustard seeds	10 g
3. Green chilly (cut to pieces)	50 g
4. Garlic (peeled)	80 g
5. Ginger (peeled and chopped)	180 g
6. Chilly powder	35 g
7. Turmeric powder	2 g
8. Gingelly oil	250 ml
9. Vinegar (3% acetic acid)	450 ml
10. Salt (approx.)	100 ml
11. Water (boiled and cooled)	400 to 600 ml

Fried the clam meat in minimum oil for about 45 min and set apart. Fried the ingredients 2 to 5 in the remaining quantity of oil and then added chilly powder and turmeric and mixed well under low flame for a few minutes. Removed from fire and mixed the fried clam meat with vinegar and sufficient quantity of boiled and cooled water to completely cover the ingredients. Mixed thoroughly and added salt to taste.

After mixing together all the ingredients, the pickle was left to 'mature' for two days and then packed in clean dry bottles (350 g) and sealed air tight with acid proof caps. While packing care was taken to prevent the exposition of meat and a layer of oil was always kept covering the pickle at the top and previously heated and cooled gingelly oil was added if necessary to ensure a protective layer of oil at the top. The products were stored for a period of 8 months in bottles at room temperature and periodically examined organoleptically and bacteriologically.

Moisture, fat, protein, ash and acid insolubles in shucked clam meat were estimated by the methods of AOAC (1955) and glycogen by the method of Kleiy (1951). The viable plate count (TPC) was determined using tryptone glucose agar (TGA). The plates were incubated at $29 \pm 1^\circ\text{C}$ (RT) for 48 h and counts taken. Total coliforms were determined using desoxy cholate

citrate agar (DCA), *Escherichia coli* using tergitol-7-agar (T7), streptococci using KF agar and coagulase positive *Staphylococcus* using Baird-Parker agar (FDA, 1973; Difco, 1971). Salmonella was detected by pre-enrichment in lactose broth followed by enrichment in tetrathionate broth. The tetrathionate broth culture was streaked on brilliant green sulphadiazine agar and incubated at 37°C for 24 h. Characteristic colonies were inoculated to triple sugar iron agar (TSI) and cultures giving characteristic reaction were further identified biochemically and serologically (Galton *et al.*, 1968). The organoleptic quality was determined by a panel of trained persons.

Results and Discussion

The proximate composition of shucked clam meat is given in Table 1. The bacteriological quality of raw clam meat before and after depuration and steamed and shucked clam meat is presented in Table 2. Depuration reduced the total plate count (TPC)

Table 1. Proximate composition of clam meat

Moisture %	78.50
Fat %	2.52
Protein %	10.09
Ash %	0.86
Acid insolubles %	0.38
Glycogen %	6.68

Table 2. Bacteriological quality of raw clam meat, depurated clam meat and shucked clam meat

	Raw clam meat		Shucked clam meat
	Before depuration	After depuration	
Total viable plate count per g	1.2×10^6	5.5×10^5	3.1×10^3
Total coliforms per g	6.3×10^3	8×10^2	50
<i>E. coli</i> per g	3×10^3	3.5×10^2	Nil
Streptococci per g	8.5×10^3	5×10^2	Nil
Coagulase positive <i>Staphylococcus</i>	Nil	Nil	Nil
Salmonella	Nil	Nil	Nil

Table 3. Changes in bacteriological and organoleptic characteristics of clam pickle

Storage period month	TPC/g	Organoleptic quality
0	6.217 x 10 ³	Good colour; tough texture; good flavour
1	2.30 x 10 ³	Good colour; moderately soft texture; good flavour
2	1.02 x 10 ³	-do-
3	4.10 x 10 ³	-do-
4	2.845 x 10 ²	-do-
6	2.046 x 10 ²	Colour slightly faded; soft texture; good flavour
8	3.203 x 10 ²	Dull colour; soft texture; slight off flavour

Coliforms, streptococci, coagulase positive *Staphylococcus* and salmonella were absent.

considerably (to about 50%) and steaming and shucking gave clam meat of low bacterial count. The changes in physical, organoleptic and bacteriological characteristics of clam pickles prepared using shucked meat and stored at ambient temperature are given in Table 3.

It has been observed during storage that whenever there was exposed meat in the pickle it became dried up and easily became a target for the growth of molds. This did not occur when the entire contents were covered with oil. Any loose fragment of meat adhering to the sides near the mouth of the bottle also was found to be susceptible to mold growth and hence extreme care is needed at the time of filling the pickles in bottles. Initially the texture of the meat was tough even though the flavour of the pickle was good. The texture of the meat became moderately soft after one month storage due to ageing. The colour slightly faded after 6 months storage and became dull after 8 months and the pickle had slight off flavour. Coliforms, streptococci, coagulase positive staphylococci and salmonella were totally absent. The TPC remained more

or less same during the first 3 months and decreased slightly subsequently. The pickle kept well for 6 months in sealed bottles at room temperature.

Pickle was also prepared using blanched shucked clam meat. Blanching losses were 15 to 20% and the frying time could be reduced to 30 min. The pickle was slightly less in taste, owing to some of the flavour bearing constituents lost during blanching. However, there were no difference in the bacteriological quality and shelf life of the pickles prepared by both ways probably due to frying the meat prior to pickling.

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