CANNING OF KING ABALONE (GASTROPODA: *CHICOREUS RAMOSUS*) IN THREE MEDIA

Jamila Patterson
Centre of Advanced Study in Marine Biology, Annamalai University, Parangipettai 608 502, India
Present address: Department of Marine Ecology, Aarhus University, Finlandsgade 14, DK-8200 Aarhus N, Denmark

ABSTRACT

King abalone (*Chicoreus ramosus*) was canned in brine, oil and tomato sauce. Brine was the most suitable medium because it maintained the characteristics of the meat over a longer period. When canned in oil, the meat lost its softness and colour during storage. The meat became very hard and the colour changed to red when canned in tomato sauce. Sterility was checked after storage. All cans were sterile.

INTRODUCTION

Canning is a well tested method which offers stable storage over long time, and a product which is ready to serve. However, only few molluscs such as abalone (Warne 1988), clam (Gopakumar 1996), and oyster (Balachandran *et al.* 1984) are used for canning.

Gastropods are caught in large quantities in India but so far very little attention has been paid to the proper utilisation of this protein rich meat. World-wide, gastropods are utilised in raw, frozen and dried form. In India drying is the common practice but the dried meat is popular only among the fishermen who consider it delicious, although somewhat tough. Due to lack of general awareness the meat it is not being used like other seafood in India. The present paper describes a canning method by which *Chicoreus ramosus* meat can be preserved for a long time.

MATERIALS AND METHODS

Chicoreus ramosus were purchased from fishermen, the shells were washed thoroughly, and boiled for 30 minutes. Then the meat was shucked from the shell, foot and adductor muscle removed, washed, and brought to the laboratory in an ice box. The various operations of processing were standardised after several trails. Fig. 1 gives a schematic account of the process.

Cleaning: The black pigments present on foot muscles were removed by scraping with a knife. The foot and adductor muscles were separated, cut into small square pieces of uniform size, and thoroughly washed.

Pre-cooking: The foot and adductor muscles were cooked separately in an autoclave at 15 lbs steam pressure for one hour to soften the meat. The cooked samples were drained well for about ten minutes.

Blanching: 2 % brine prepared from refined salt was used for blanching the cooked meat. Citric acid (0.5 %) and Ethylenediaminetetraacetic acid (EDTA 0.1 %) were also added with the brine and the meat was boiled for 30 minutes. After blanching the meat was again drained well to remove water.

Filling: Empty cans were initially washed properly with potable water and dried well. A known weight (125 g) of blanched meat was filled by hand in sulphur resistant 8 oz lacquered cans of size 301 x 203.

Three types of filling media were used: brine, refined groundnut oil and tomato sauce. The brine was prepared by dissolving 2 % refined salt in distilled water, commercial groundnut oil was used as such, and tomato sauce by diluting the commercial sauce with water (1:1). All the media were

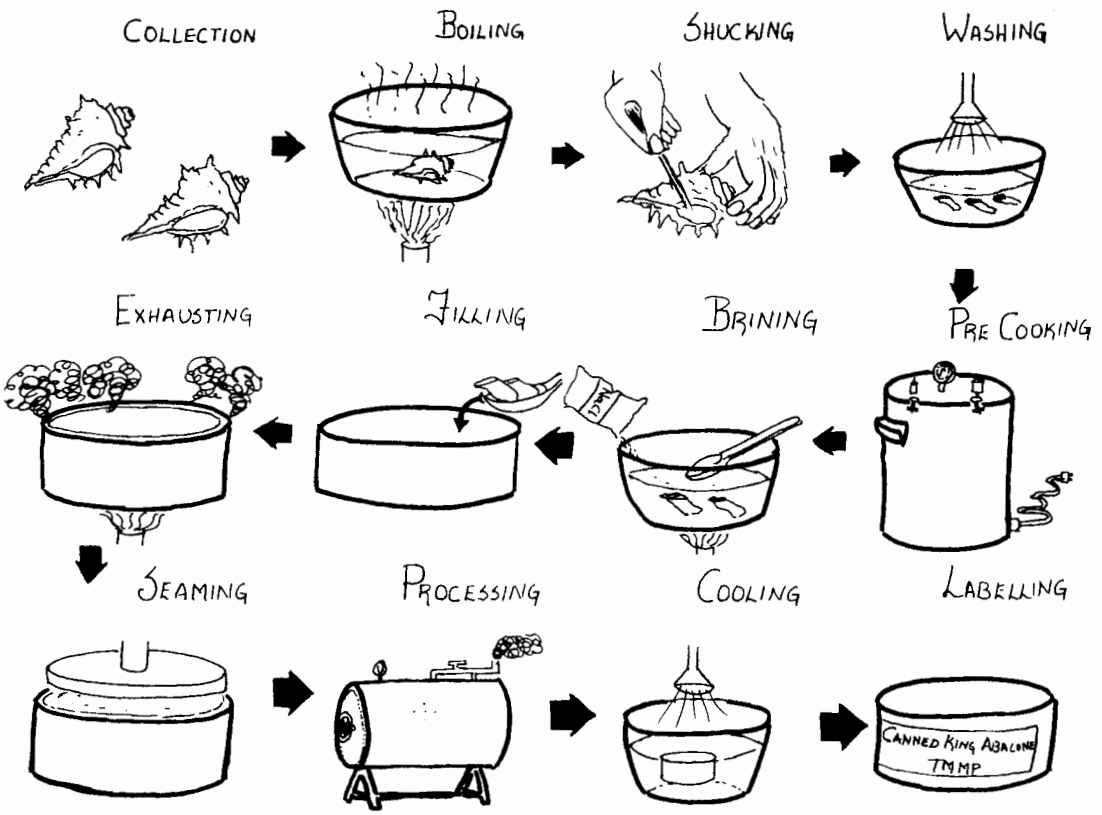

Figure 1. Various steps in canning of *Chicoreus ramosus*.

heated to 90-100 °C and the cans filled, leaving a head space of about 5-8 mm.

Exhausting: The filled cans were exhausted in steam with lids on for about 10 minutes at 100 °C to remove the air from can contents and head space.

Seaming: Seaming is the tight seal between the cover and the body of the container. The exhausted cans were promptly double seamed while hot. The seamed cans were immediately washed with detergent to remove the oil and sauce adhering to the can surface.

Processing: Processing was carried out under 15 lbs steam pressure at 121 °C for 45 minutes.

Cooling and cleaning: The processed cans were cooled suddenly in chlorinated cold water to 37 °C. After cooling the cans were cleaned in alkaline water, properly wiped, and stored in a dry place at room temperature.

Table 1. Weight range and yield af meat.

Weight range	600 - 1,860 g
% yield:	
Fresh, shucked meat	10.1 %
Boiled, shucked meat	9.74 %
After blanching (canning yield)	6.91 %

Vacuum determination and microbial analysis: Vacuum in the cans were determined with a vacuum gauge of the piercing type. The sterility of the cans was analysed using thioglycollate test after the cans were incubated for 14 days at 37 °C and 55 °C.

The top of the can was wiped with clean cotton soaked in 95 % ethyl alcohol. The can was held by hand, inverted, and moved in circles over a flame, distributing the heat

Table 2. Results of the panal tests.

Characteristic of the product	Brine pack	Oil pack	Sauce pack
General appearance on opening the can	good	good	good
Colour of the meat	cream	slightly brown	red
Flavour	good	good	fair
Taste	good	good	satisfactory
Texture	soft	slightly hard	very hard
Can interior	normal	normal	normal
Microbiological activity	nil	nil	nil

over the top of the can. The can was placed in upright position and the flamed top covered with a sterile Petri dish. The top of the can was punctured with a sterilised spike, 0.5-1 ml fluid sampled with a sterilised pipette, and transferred into tubes with thioglycollate medium. Great care was taken at this stage in order to minimise oxidation of the tube contents. The tubes were incubated and bacterial growth examined.

Organoleptic character analysis: The cans were opened once in a month and tested for quality. The texture, taste, colour and can interior were checked periodically and the shelf-life was assessed.

RESULTS AND DISCUSSION

Specimens ranging from 600-1,860 g total weight were used for the extraction of meat. The average yield of fresh meat was 10.1 %, while the yield after boiling and shucking was 9.74 %. The final yield after blanching was 6.91 %.

Shucking of meat after boiling is the easiest and best way because the beautiful shell can be preserved (shell and operculum are economically important and keep their value after shucking). Comparatively the yield of meat is lower than that of fish and prawn. However, oysters and clams are also used for canning, even though the final yield is very low (2-2.3 %).

Before canning, the foot and adductor muscles were pre-cooked for one hour under pressure to soften the meat. Both the types of meat became soft but at the same time some black discoloration developed. In order to avoid the black colouration, treatment with chemicals such as EDTA, ascorbic acid, and lime juice were tried while cooking the meat. All three additives were effective. EDTA, however, was most promising. The meat cooked with ascorbic acid was soft, but the colour changed slightly. The lime juice (15 %) treated meat was white in colour, but the texture was very hard. The EDTA treated meat retained the original colour and become very soft. Blackening of canned seafood is a common problem and it has also been reported in abalone, prawns and crabs. Blackening is mainly caused by the formation of sulphides of iron and copper already present in the meat.

Table 3. Economics for king abalone meat packed in brine. 200 g canned king abalone (including can) costs approx. Rs. 22.70 (*ie* approx. US$=0.60).

The cost of 125 g meat	10.70 Rs.
Can cost (one can)	8.00 Rs.
Other miscellaneous expenses (collection, fuel, salt etc.)	4.00 Rs.
Total cost	22.70 Rs.

EDTA is accepted by the codex committee on food additives and it is used in the canning industries (Mathen 1972). In the present study 100 mg EDTA was added to 1 kg meat before cooking. This was much lower than the recommended level for shrimps (250 mg kg^{-1}).

The *C. ramosus* meat was hot-blanched. Due to this procedure, the meat shrunk sufficiently to permit adequate filling and give salty taste. Blanching may be performed hot or cold. It is a normal process for the seafood before canning.

The exhaust process was done with the

lid on to create sufficient vacuum in the cans. In the final product 4-6 inches of mercury vacuum was observed.

From the microbial evaluation it is clear that all cans were sterile. The time of heat processing varies with the raw material and from the present results it is clear that 45 minutes of heat is sufficient for the sterilisation of the canned gastropod meat.

Both foot and adductor muscles canned in different media remained as discrete pieces without sticking together or forming lumps. The meat canned in the 3 media was good, in general. Differences were observed only in the texture and colour of the meat. In an evaluation of the organoleptic quality, meat canned in brine was best followed by groundnut oil and tomato sauce (Tab. 1).

Meat packed in brine maintained its softness, colour and flavour during the storage period. Meat in oil was slightly hard and the colour also slightly changed. Meat in sauce became hard and the colour of the meat turned red (sauce colour). The texture of the meat was very hard, probably due to the acidic nature of the sauce.

It is concluded that the brine is the best filling media for *C. ramosus* meat. Both foot and adductor muscles can be canned together in this medium. Balachandran *et al.* (1984) canned oyster meat in these three media and found oil as the best one for oyster. In the case of fishes oil is the recommended medium for canning (Saralaya *et al.* 1975; Balachandran & Vijayan 1989). But, for the canning of prawns, brine is the best medium, and it was certified by Indian Standard Institution (Indian Standard, 1968). From the preliminary canning experiment, brine is recommended as the best filling medium for gastropod meat. A cost analysis was performed on brine pack (Tab. 3) which shows that the cost per can (200 g) is very reasonable. By using brine as filling medium, the gastropod meat can be processed into a ready-to-serve product for commercial purpose.

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REFERENCES

Balachandran, K.K., P.K. Vijayan & P.V. Prabhu. 1984. Canning of edible oyster meat. - Fishery Technology **21**: 47-50.

Balachandran, K.K. & P.K. Vijayan. 1989. Studies on canning *Psenopsis cyanea*. - Fishery Technology **26**(2): 111-113.

Gopakumar, K. 1996. Port-harvest handling, processing and quality control of molluscan products. - Phuket Marine Biological Center Special Publication **16**: 1-6.

Indian Standard, 1968. Indian Standard specification for prawns/shrimps canned in brine. Indian Standard Institution, New Delhi.

Mathan, C. 1972. A method for prevention of blackening and improvement of colour in canned prawns. - Seafood Export Journal **4**(11).

Saralaya, K.V., P. Parashuramand & B.S. Rai. 1975. Studies on canning of mackerel fillets in oil. - Fishery Technology **12**(2): 120-126.

Warne, D. 1988. Manual on fish canning, FAO fisheries technical paper 285. FAO of United Nations, Rome, 71 pp.

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