# A New Procedure for Canning of Squids

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A new canning procedure for squid mantles aimed at increasing the fill and retaining the sweet flavour of squids was evolved. In the new method, after blanching smaller mantles are inserted inside bigger ones to reduce voids and thus increase the fill to 56% and above as compared to 46% when packed as rings. In addition, spent blanching medium containing desirable flavour constituents of squid was modified and used as covering medium which increased the flavour of canned product.

Cephalopods, comprising of squids, cuttle fish and octopus contribute to an average of 12,370 t out of the total marine landings of 13,36,000 t on the Indian coast (1977–81) Gujarat contributes 24% of the cephalopod catch. (Marine Fisheries Information Service, 1982). Globally squids are utilised in raw, dried, frozen and canned forms; raw and dried squids being more popular. Two chief sensory attributes of squid are its sweet taste and a unique texture characterised by a chewiness similar to meat. The sweet taste linked to amino acids in the NPN fraction (Shiniza & Takida, 1952) is desirable and hence to be retained, but an excessive chewiness is not desirable (Hamann, 1979). Canned squids are popular in Japan, China and other oriental countries. They are canned either as minced meat or as cephalopoditic part inserted in mantle cavity. Either brine or a seasoning based on soya paste or sauce is employed as covering media. (Forgstrome, 1965). In India, Varma & Joseph (1980) canned squid mantles in ring form in an acidified brine obtaining good results. However, canning mantles in ring form does not give a good fill in the can (ratio of drained weight to nett water capacity of can) due to large void space in rings, while packing head and tentacles inside mantle cavity is unlikely to be relished by the consumer. This paper describes a new canning procedure aimed at improving the fill and the retention of sweet flavour of canned squids, albeit at a little loss in overall yield as head and tentacles.

## Materials and Methods

Squids *(Loligo* sp.) of 8-12 cm mantle length both fresh and from 3 day fishing trips of commercial trawlers in iced condition were obtained and immediately brought to the laboratory, head, fins, and viscera, removed (average yield 40–45%) and stored overnight at 3–4°C prior to further processing.

*Blanching treatment*

Mantles were divided into lots of equal quantity and subjected to the following blanching treatments.

Group A. Fresh squids-

1. Low temperature blanching.

Treatment No. 1 (T-1) – In 5% brine, at 75–80°C for 30 min, 1:2 ratio of squids to blanching medium (BM)
„ 2 (T-2) – In 7.5% brine, as in T-1
„ 3 (T-3) – In 10% brine, as in T-1
„ 4 (T-4) – In water, as in T-1

2. High temperature blanching.

Treatment No. 5 (T-5) – in 7.5% brine, boiled for 10 min 1:1 ratio of squids to blanching medium

,, 6 (T-6) – Added boiling water and further steamed for 8–9 min, 2:1 ratio of squids to BM

,, 7 (T-7) – Added boiling 0.2% citric acid (CA) and further steamed for 8 min. 2:1 ratio of squids to BM

,, 8 (T-8) As at T-7, but steamed for 12 min

,, 9 (T-9) As at T-7, but steamed for 16 min

,, 10 (T-10) As at T-7 but steamed for 20 min

Group B. Iced squids from 3 day fishing trip.

Treatments T-5, T-7, T-8, T-9 and T-10 as above were repeated.

After blanching, the spent blanching medium (SEM) was drained and kept aside for further use in some of the treatments. Mantles were cooled in cold water.

*Dressing and filling*

Ends of mantles were trimmed and further prepared for filling in cans either by

a) cutting into 0.5 cm rings using scissors

b) in the new packing mode, a smaller mantle was inserted/stuffed inside a bigger one.

The rings or stuffed mantles were packed separately in 301 x 206 SR lacquered cans noting the filling weight. Two different covering media employed were:

1) 2% brine along and 2) a modified SBM prepared by filtering SBM through a pad of absorbent cotton, fortified with 2.5% salt, 0.2% salt, 0.2% CA and 0.1% mono sodium glutamate (w/v), boiling and filtering again before use.

*Retorting*

After topping with respective media, the cans were exhausted for 10 min, seamed and processed at 1.1 kg/cm for 30 min. Processed cans were cooled in running water, cleaned, wiped dry and stored at ambient temperature.

Cut out analysis of cans were done after 2 weeks of equilibration. Can contents were examined for physical and sensory parameters and for commercial sterility by thioglycollate test (Difco Manual 1977), nitrogen estimations were done by microkjeldahl method (AOAC, 1975). For storage studies cans were opened at 2 monthly intervals.

**Results and Discussion**

All cans examined showed more than 100 m vacuum and were commercially sterile by the thioglycollate test. Effects of blanching treatments on weight loss by blanching (BL), weight loss after sterilization (WLS) and the percentage fill are presented in Table 1. In low temperature blanching higher BL and WLS with correspondingly lower % fill were observed with water and cover strength brine (T-1 and T-4). Increasing of the brine strength reduced BL and WLS (T-2 and T-3). In high temperature blanching treatments, T-5 led to maximum BL with fresh squids, but mantles after the treatment had shrunk much and also had a rough, dry and pinkish appearance. Such shrinkage has been observed by Otwell & Hamann (1979) in boiled squids. Blanching by addition of boiling water or 0.2% CA and subsequent steaming for various time intervals (T-6 to T-10) gave mantles with better appearance except when longer steaming periods were used (T-9 and T-10). In case of water (T-6), higher BL was observed when compared to 0.2% CA (T-7) but WLS and % fill were similar. Increase in steaming time using 0.2% CA led to progressively higher BL and lower WLS, with increased % fill. It is evident that use of less fresh squids (Poorly iced from long duration commercial trawlers) leads to higher BL. But differences in WLS between fresh and poorly iced squids were not appreciable except in T-7 and narrowed down with increase in blanching time. The deteriorative changes in squids during iced storage and its intrinsic protease activity (Jose Joseph *et al.* 1977; Raghunath, 1984 and Rodger *et al.* 1984) could lead to increase in BL. The heat stable fraction remaining after blanching, being less prone to further changes

Table 1. *Blanching loss and equilibrium characters of canned squids in relation to blanching treatments* and packing styles and covering media employed*

| Sl. No. | Blanching treatment | Loss on blanching (BL) | Weight loss on sterilization (WLS) | Drained weight to net water capacity of can % fill) | Packing style | Covering media |
|---|---|---|---|---|---|---|
| Group A. Fresh squids | | | | | | |
| 1. Low temp. blanching | | | | | | |
| | T–1 | 26.3 | 23.5 | 44.0 | Rings | 2% brine |
| | T–2 | 23.5 | 20.4 | 45.7 | Rings | 2% brine |
| | T–3 | 23.4 | 17.8 | 47.3 | Rings | 2% brine |
| | T–4 | 25.0 | 26.9 | 42.0 | Rings | 2% brine |
| 2. High temp. blanching | | | | | | |
| | T–5 | 35.0 | 20.0 | 46.0 | Rings | 2% brine |
| | T–6 | 27.1 | 21.4 | 56.9 | Stuffed mantles | modified SBM @ |
| | T–7 | 23.5 | 21.5 | 56.9 | ,, | ,, |
| | T–8 | 25.0 | 20.1 | 57.0 | ,, | ,, |
| | T–9 | 27.0 | 19.1 | 58.6 | ,, | ,, |
| | T–10 | 30.0 | 16.9 | 60.2 | ,, | ,, |
| Group B. Iced squids from commercial trawlers | | | | | | |
| | T–5 | 41.0 | 15.7 | 59.0 | ,, | ,, |
| | T–7 | 33.0 | 28.3 | 52.5 | ,, | ,, |
| | T–8 | 41.0 | 22.2 | 56.7 | ,, | ,, |
| | T–9 | 42.2 | 19.4 | 58.4 | ,, | ,, |
| | T–10 | 45.0 | 16.7 | 60.3 | ,, | ,, |

*see materials and methods for treatment details; @ SBM = spent blanching medium

by thermal processing, the difference in WLS between the two groups narrows down.

The improvement in % fill of cans as a result of changes in packing method is evident from Table 1. Even with a severe blanching and consequent lower WLS (T-5) packing mantles as rings yielded a % fill of only 46. The mean net filling weight in case of rings was 115–120 g. A higher amount could not be filled due to the large voids between and inside rings. This void was effectively reduced in the new mode of packing by insertion of smaller mantles inside bigger ones. This increased both net filling weight (to 145 g) and also consistently gave a good fill of 56% and above. A 16–17% WLS persisted regardless of severity of blanching (T-10). It was observed during the experiments that by using very fresh squids and increasing filling weight to 155–160 g the % fill could be increased to 60% and above but this tended to result in overfilling. While a 60% fill could also be obtained by longer blanching time (T-10) or perhaps by blanching under pressure to reduce WLS, excessive thermal processing involved in this resulted in adverse textural changes as previously noted in prolonged boiling of squids by Otwell & Hamann (1979).

**Table 2.** *Organoleptic characters of canned squids in relation to blanching treatments and filling media used*

| Blanching treatment | Covering brine-media characters | | | Squids characters | | | Filling media |
|---|---|---|---|---|---|---|---|
| | Colour | Sediment | Flavour | Colour | Flavour | Texture | |
| A. Fresh & iced squids | | | | | | | |
| 1. Low temperature blanching | | | | | | | |
| T–1 | clear pale white | present | Light salty | dull white blackening on storage | light saltish acceptable | soft rubbery and chewy | 2% brine |
| T–2 | ,, | ,, | optimum salty | ,, | ,, | softer, less chewy | ,, |
| T–3 | ,, | very less | salty | ,, | ,, | ,, | ,, |
| T–4 | ,, | present | light salty | ,, | ,, | soft, rubbery and chewy | ,, |
| 2. High temperature blanching | | | | | | | |
| T–5 | clear pale white | present | salty | ,, | insipid salty | soft, no chewiness | ,, |
| T–6 | clear pale yellow | very less | sweet light saltish | ,, | light saltish sweet, good taste | soft, firm slightly chewy | recovered SBM |
| T–7 | ,, | ,, | ,, | dull white no blackening | ,, | ,, | ,, |
| T–8 | clear pale yellow | very less | sweet, light saltish | ,, | light saltish sweet, good taste | soft, firm slightly chewy | recovered SBM |
| T–9 | ,, | ,, | ,, | ,, | ,, | as above, firmer & dry | ,, |
| T–10 | ,, | ,, | ,, | ,, | ,, | ,, | ,, |
| B. Iced squids from 3 day fishing trip | | | | | | | |
| As at T–5 | ,, | present | salty sweet | dull white light brownish | saltish sweet acceptable | soft, no chewiness | ,, |
| ,, T–7 | ,, | less | sweet, light saltish | ,, | ,, | soft, firm and chewy | ,, |
| ,, T–8 | ,, | less | ,, | ,, | ,, | firm & chewy | ,, |
| ,, T–9 | ,, | very less | ,, | ,, | ,, | firm & chewy | ,, |
| ,, T–10 | ,, | ,, | ,, | ,, | ,, | firm to hard dry & chewy | ,, |

Note: All cans showed >100 mm vacuum and was commercially sterile by the thioglycollate test

Organoleptic characters of the squids and covering medium *vis-a-vis* the blanching treatments and covering media used are given in Table 2. In low temperature blanching, 7.5% brine gave best results. Lower brine strength and water (T-1 & T-4) gave a rubbery texture while 10% brine (T-3) led to a salty covering medium. Further, absence of CA in BN and covering medium resulted in blanching of mantles upon storage as previously reported (Varma & Joseph, 1980). Sweet taste of squids was also not very evident in these treatments. Squids from T-5 were excessively soft with little chewiness. In high temperature blanching, T-7 and T-8 gave most satisfactory results with a soft, firm and slightly chewy texture. Increased blanching times (T-9 and T-10) lead to firm and hard texture and a dryness was evident in the mantles. Incorporation of 0.2% CA in BM and covering medium prevented blackening of mantles on storage.

It was been noticed during blanching that considerable protein and non-protein nitrogen was lost into the blanch liquor. For example in T-7 the SBM contained 5.1 mg N/ml of which 3.5 mg were NPN and the SBM had a pleasant sweet taste. Hence efforts were made to utilise the SBM as covering media by modifications as described before. The filtrations and boiling were necessary to remove the protein coagulam. Improvement in flavour of mantles and covering medium as a result of using modified SBM is given in Table 2. The covering medium had a sweet light saltish taste and the mantles acquired light saltish sweet taste as a result.

Storage studies of squids canned by the new packing method and filled with modified SBM, showed that canned product was in good condition up to 1 year and the acceptable condition for a further period of 6 months. Slight browning of covering brine and mantles was observed after 8 months which increased to a noticeable light brown in mantles and yellowish light brown in covering medium after 1 year. Taste of mantles also gradually became blander after 1 year. Thus improvement can be made in drained weight and flavour of canned squids by using modified SBM as covering media.

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