

ON THE CANNING OF *SARDINELLA FIMBRIATA* *SARDINELLA GIBBOSA* AND *SARDINELLA SIRM* IN OIL PACK

R. SRINIVASAN, P. JAYACHANDRAN AND P. PITCHAIAH
Fisheries Technological Station, Tuticorin.

This note gives details of experiments conducted on the canning of certain species of sardines viz. *Sardinella fimbriata*, *Sardinella gibbosa* and *Sardinella sirm* which are landed in commercial quantities in the East Coast of Madras State and which have not so far been tried for canning. The experiments conclusively prove that these species of sardines can also be canned in oil pack and good canned products manufactured out of them.

INTRODUCTION

Canning of sardines (*Sardinella Sp.*) is an established industry in the West Coast of our country over a number of years. Oil Sardines (*Sardinella longiceps*) is the variety that is canned in these parts. Specification for sardines (*Sardinella Sp.*) canned in oil has been prescribed in I. S: 2421-1963. A procedure for canning of oil sardine (*Sardinella longiceps*) that gives comparatively a standard product has recently been worked out by the Central Institute of Fisheries Technology, Ernakulam (1964).

But so far no work has been done with the species of sardines landed in commercial quantities in the East Coast of Madras State. About 300 tonnes of *Sardinella fimbriata*, *Sardinella gibbosa*

and *Sardinella sirm* are annually landed in Tuticorin alone (Chacko and Rajendran, 1959). These sardines are also landed in equally large quantities in other fishing villages in the neighbourhood of Tuticorin. *Sardinella fimbriata* is caught right through the year with peak season from October to April. *Sardinella gibbosa* is landed in large quantities from April to June and September to November. *Sardinella sirm* has the peak season from October to March. In view of the huge landings of these species of sardines, studies were conducted by the authors at the Fisheries Technological Station Laboratory at Tuticorin to can these three species of sardines and to standardise the procedure for their canning in oil pack.

PROCESSING METHOD

The processing method finalised after

a series of experiments with the 3 species of sardines is described below:

1. *Material:* Use only fresh fish.
2. *Cleaning:* Wash the fish thoroughly in flowing water to remove slime, blood, dirt etc. Remove the head, fins, scales, tail and viscera. During this process keep the fish sufficiently iced. Wash thoroughly again to remove blood, dirt, etc., using potable water.
3. *Brining:* Keep the fish immersed in ice cold saturated salt solution for about 15 to 20 minutes. Take out the fish, wash them slightly by giving gentle dip in potable water and allow to drain completely.
4. *Packing:* Pack the pieces vertically into clean lacquered cans adjusting the pack weight to 200 to 210 g for 301 × 206 size cans. For *Sardinella sirm* the pack weight should be adjusted to 320 g and the packing made in 301 × 309 size cans.
5. *Pre-cooking:* Cook in steam for 25 to 30 minutes at 100°C (atmospheric pressure). Drain the cooked body-water completely by keeping the cans in the inverted position for about 15 minutes.
6. *Filling with oil:* Fill the cans completely with refined, deodourised ground nut oil heated to 100°C.
7. *Exhausting and seaming:* Exhaust the filled cans for about 10 minutes in an exhaust box. Seal the cans immediately.
8. *Washing the cans:* Wash the cans in alkaline water to remove the oil and other impurities sticking to the surface.
9. *Processing:* Process the cans in an autoclave for 80 to 90 minutes depending upon the species at a steam pressure of 10 — 12 psig

10. *Cooling:* Immediately after processing cool the cans in a flow of cold water or in a tank of cold water; when it is cool dry the outside of the cans and stack in a cool dry store-room.

DETAILS OF EXPERIMENTS:

With a view to determine the optimum durations of brining, pre-cooking and processing the three species of sardines, a series of experiments were conducted changing the durations of these stages in the different experiments. The refined ground nut oil was also heated to different temperatures 180°C and 100°C respectively before adding. When oil was heated to 180°C no exhausting was done, but when oil was heated upto 100°C exhausting was done for 10 minutes after packing. The cans made in each experiment were sent to the members of a taste panel specially constituted for the purpose and also to the Director, Central Institute of Fisheries Technology, Ernakulam for their opinion about the products. The defects pointed out by them in the earlier experiments were suitably rectified in the later experiments. The results of some of these experiments are shown in Annexure - II. In the earlier experiments the fish was immersed in saturated salt solution for 15 minutes. The pack weight was adjusted to 220 g and the pre-cooking done in steam for 15 minutes. The sterilization was done at 10 psig steam for 60 minutes. Nearly 1/3 of the total volume of fill in these cans was found to be water and more than 50% of the pieces had the skin peeled off. In the later experiments, to get a more firm texture in the product and also to remove the slime on the fish the brining time was increased to 20 minutes first and then to 30 minutes. However blanching for 30 minutes was not found suitable since the product was highly saltish to taste. The pre-cooking time was also increased from 15 minutes

ANNEXURE I SHOWING THE OPTIMUM CONDITIONS OF PROCESSING FOR
THREE SPECIES OF SARDINES

Sl. No.	Particulars	<i>Sardinella fimbriata</i>	<i>Sardinella gibbosa</i>	<i>Sardinella sirm</i>
1.	Can size	301x206	301x206	301x309
2.	Pack weight g	200	200	320
3.	Net weight g	226	226	330
4.	Brining time	20 minutes	20 minutes	20 minutes
5.	Precooking time	30 „	30 „	30 „
6.	Sterilization pressure	10 psig	10 psig	10 psig
7.	Sterilization temp.	115.5°C	115.5°C	115.5°C
8.	Sterilization time	60 minutes	80 minutes	90 minutes

to 30 minutus to reduce the quantity of water in the fill. The pack weight was also brought down to 210 g and then to 200 g so that the percentage of the drained weight was slightly more than 70% as required in the I.S: 2421-1963.

DISCUSSION.

Brining of sardines was done in saturated salt solution as recommended by Jarvis (1943) as against 15% salt solution only adopted by the Central Institute of Fisheries Technology (1964 loc. cited). The duration of brining had also to be increased upto 20 minutes as against 15 minutes only recommended by the Central Institute of Fisheries Technology to obtain a product with firm texture. The sterilization pressure and time had also to be kept low at 10 psig steam for 60 minntes for *Sardinella fimbriata* as against 12 psig steam for 75 minutes for *Sardinella longiceps*. The differences in the conditions of brining and

processing between the 2 species *Sardinella fimbriata* and *Sardinella longiceps* may be due to their different chemical compositions. (Chari 1948 and Administration Report 1961). Even among the 3 species canned by the authors differences in the duration of processing were noticed as shown in Annexure-I. *Sardinella gibbosa* and *Sardinella sirm* require longer durations of sterilization of 80 minutes and 90 minutes respectively at 10 psig steam for their bones to be softened than *Sardinella fimbriata* which require 60 minutes sterilization only at 10 psig steam.

In our experiments two different modifications were tried in the stages 6 and 7. In one set oil at 100°C was added followed by steam exhausting for 10 minutes and seaming as mentioned above. In another set oil was heated upto 180°C without carbonisation before adding and was followed by immediate seaming without exhausting. The latter method gave a

ANNEXURE II SHOWING THE PROCESSING DETAILS AND CAN

1. Species of sardine canned	<i>Sardinella fimbriata</i>	<i>Sardinella fimbriata</i>
2. Type of pack	Oil pack	Oil pack
3. Date of pack	15-1-'65	27-1-'65
4. Can size	301x206	301x206
5. Brining time in minutes	15	20
6. Pack weight in grams	215	215
7. Pre-cooking time at 100°C in minutes	15	20
8. Temperature of oil added in °C	180	100
9. Net weight in grams	220	220
10. Processing at steam pressure in lbs.	10	10
11. Processing temperature °C	115.5	115.5
12. Processing time in minutes	60	60

Test Results :

1. Can exterior	Good	Good
2. Gross weight in grams.	275	275
3. Vacuum cm.	20	20
4. Head space mm	5	5
5. Volume of fill ml.	60	62
6. Colour of oil	Golden yellow	Yellow
7. Water content ml.	10	10
8. Net weight in grams.	221	221
9. Drained weight in grams.	166	164
10. Condition of bone	Soft	Soft
11. Condition of skin	Skin off in 4	Skin off in 5
12. Foreign particles	Nil	Nil
13. No. of pieces	17	17
14. Appearance	Fair	Fair
15. Colour	Fair	Fair
16. Odour	Fair	Fair
17. Flavour	Good	Fair
18. Texture	Soft	Soft
19. Discoloration	Nil	Nil
20. No. of broken pieces	Nil	Nil
21. Can interior	Slightly brown	Good
22. Microbiological activity	Nil	Nil

TEST RESULTS OF CANS OF *SARDINELLA* SP. IN OIL PACK.

<i>Sardinella fimbriata</i>	<i>Sardinella gibbosa</i>	<i>Sardinella sirm</i>
Oil pack	Oil pack	Oil pack
10-3-65	24-11-64	22-10-64
301x206	301x206	301x206
25	20	15
200	210	320
25	20	25
180	100	180
220	220	335
10	10	10
115.5	115.5	115.5
60	80	90
Good	Good	Good
282	280	380
20	7.5	30
3	10	5
70	60	95
Yellow	Golden yellow	Golden yellow
5	8	18
223	225	323
160	170	236
Soft	Soft	Soft
Skin off in 5	Skin off in 3	Skin off in all
Nil	Nil	Nil
18	16	10
Fair	Sastisfactory	Fair
Fair	Fair	Fair
Fair	Fair	Fair
Good	Fair	Fair
Soft & fair	Very soft	Fair
Nil	Nil	Nil
Nil	Nil	Nil
Good	Slightly blackening	Good
Nil	Nil	Nil

very high vacuum upto 35 cms. on some occasions but there was no uniformity. In the other case a uniform vacuum of 20 cms. was obtained. Hence the heating of oil upto 100°C, followed by steam exhaustion for 10 minutes has been recommended in the processing method described above. Further in the products in which oil heated upto 180°C was used, the skin was found to be off in most of the pieces.

The present experiments conclusively prove that species of sardines other than *Sardinella longiceps*, namely *Sardinella fimbriata*, *Sardinella gibbosa*, and *Sardinella sirm* which are landed in commercial quantities in the East Coast of Madras State, can also be canned in oil pack and good canned products manufactured out of them.

ACKNOWLEDGEMENT

Our thanks are due to the Director of

Fisheries, Madras for his permission to publish the paper. Our thanks are also due to the Taste Panel Members and the Director, Central Institute of Fisheries Technology, Ernakulam for testing the cans and for their valuable suggestions.

REFERENCE

- Anon 1964. *Fish Technology news letter* 5, 1; Central Institute of Fisheries Technology., Ernakulam.
- Anon; 1961. *Administration Report*, Department of Fisheries, Madras for 1959-60.
- Chacko, P. I. & Issac Rajendran, A. D. 1959. *Fisheries Station Reports and Year Book*. Government Press Madras.
- Chari S. T. 1948. *Indian J. Med. Res.* 36, 3, 254-55.
- Jarvis N. D. 1943. *Research Report No. 7*, U.S. Dept. of the Interior, Fish and Wildlife Service.