

Preparation of Salted-pressed *Psenes indicus* and its Storage Characteristics

R. Chakraborti, S.S. Gupta and C.C. Panduranga Rao

Research Centre of Central Institute of Fisheries Technology, Kakinada - 533 003

This paper describes a process for the preparation of salted and pressed *Psenes indicus* and its storage characteristics. Dressed *Psenes indicus* immersed in saturated brine for 7 days, were pressed under pressure of 0.048 to 0.08 kg/cm². The salted and pressed fish packed in 70 μ nylon/surlyn bag under vacuum was acceptable for 120-135 days, while those packed in 200 gauge polythene bag without vacuum was acceptable for 45-60 days at ambient temperature. 0.1% propionic acid treated salted and pressed *Psenes indicus* had 15 days longer storage life than untreated one.

Psenes indicus poses considerable difficulty in preservation and large quantities are being unhygienically cured and dried. As this fish contains considerable amount of fat, the traditionally dried products become unacceptable within short period because of discolouration and rancidity. Hence there is a need to develop suitable technology for preservation of this species. Hiremath *et al.* (1985), King *et al.* (1982) and Lima dos Santos (1977) investigated Brazilian method of salt curing and pressing of oil sardine, and reported that the storage life of pressed and salted oil sardine varied from three weeks to two months depending on storage temperatures, from ambient to 0°C. Hiremath *et al.* (1987) found that the storage life of salted and pressed oil sardine could be increased by 4 to 6 weeks by increasing the salt content in meat to saturation level.

In the present study the preparation of salted pressed *Psenes indicus* and its storage characteristics under vacuum and normal atmosphere at ambient temperature are discussed.

Materials and Methods

Psenes indicus (9 - 12 cm length) kept in ice for 4 to 6 h were gutted, beheaded and washed thoroughly with potable water. The dressed and cleaned fish was grouped into

two and immersed in saturated brine and saturated brine with 0.1% (v/v) propionic acid respectively. Excess salt was added to brine for both to maintain saturation even after release of water from immersed fish. Water activity of the salted fish was determined at 24 h interval. The fish was kept in saturated brine till the water activity in fish flesh was almost constant.

After draining the fish from each solution were divided into three parts and pressed at pressures 0.048 kg/cm² (A), 0.064 kg/cm² (B) and 0.08 kg/cm² (C) respectively for 15 h.

The salted and pressed fish from saturated brine (A₁, B₁ and C₁) and from saturated brine with propionic acid (A₂, B₂ and C₂) were packed in 200 gauge polythene bag without vacuum (A₁₀, B₁₀, C₁₀, A₂₀, B₂₀ and C₂₀) and 70 μ nylon/surlyn bag under vacuum, (A₁₁, B₁₁, C₁₁, A₂₁, B₂₁ and C₂₁) using vacuum sealing unit. The fish packets were stored in card board boxes at ambient temperatures (36 $\pm$ 9°C) and RH (67 $\pm$ 33%).

The pressed and salted *P. indicus* were analysed fortnightly. Moisture, total nitrogen, fat and sodium chloride content of fish meat and peroxide value (PV) of fat were estimated according to AOAC methods (1975). Total volatile base nitrogen

(TVBN) was measured by Conway micro-diffusion method (1947) using trichloro acetic acid extract of meat. Water activity of fish meat was measured by equilibrating the samples at different RH (Stokes & Robenson, 1947) and measuring equilibrium moisture content. The salted and pressed fish was washed in potable water and then boiled in 10 times water by weight for 10 min for organoleptic evaluation. The organoleptic evaluation of cooked fish was carried out by a taste panel consisting of 5 members on five point scale : 5 very good, 4 good, 3 acceptable, 2 poor and 1 very poor.

Results and Discussion

Table 1 shows the changes in water activity during the salting process. On equilibrium (by 7 days) the water activity of fish muscle was 0.824. The salted fish was pressed at different pressures and the changes in proximate composition is given in Table 2. The product became more tough with increasing pressures during pressing. At pressures 0.064 and 0.08 kg/cm², significant difference in moisture content of muscle was not noticed but the product became too tough at 0.08 kg/cm². The desalted fish had neutral flavour and it retained its

shape.

Table 1. *Changes in water activity (a_w) in the muscle of *Psenes indicus* during storage in saturated brine*

Curing time, days	Water activity (a_w)
0	0.967
1	0.945
2	0.921
3	0.891
4	0.865
5	0.841
6	0.825
7	0.824

Red halophiles were noticed in A₁₀ by 60 days storage while it was absent both in A₂₀ and A₁₁. This indicated that propionic acid treatment delayed the growth of halophiles but the extension of shelf life was only by 15 days (Table 3). Similar result was reported by Hiremath *et al.* (1987) during storage of salted and pressed oil sardine. Vacuum packaging aided considerably in increasing the storage life of product. The values of PV of vacuum packed fish was much lower than that of ordinary polythene packed one (Table 3). Mendelsohn (1974) reported that vacuum packed

Table 2. *Proximate composition of salted and pressed *Psenes indicus**

	Pressure applied kg/cm ²	Moisture %	Crude protein %	Fat %	Salt %
Fresh fish	—	73.6	18.92	3.62	—
Fish from saturated brine	0.048	51.3	23.21	4.82	16.32
	0.064	50.2	22.41	5.31	16.49
	0.080	49.7	22.25	5.40	16.55
Fish from saturated brine with 0.1% propionic acid	0.048	50.8	22.8	4.91	16.56
	0.064	49.8	21.9	5.35	16.68
	0.080	49.6	21.7	5.48	16.74

Table 3. Changes in moisture, TVBN, PV and overall quality of salted *Psenes indicus* packed in polythene and in Nylon/Surllyn under vacuum and stored at ambient temperature ($36\pm9^\circ\text{C}$) and RH ($67\pm33\%$)

Storage time, days	Moisture, % (Mean $\pm$ SD)			TVBN, mg% (Mean $\pm$ SD)			PV, milli equiv/ kg of fat (Mean $\pm$ SD)			Overall quality (Mean value)		
	A10	A20	A11	A10	A20	A11	A10	A20	A11	A10	A20	A11
0	51.3 $\pm$ 0.45	50.8 $\pm$ 0.55	51.3 $\pm$ 0.45	15.5 $\pm$ 0.61	19.9 $\pm$ 0.68	15.5 $\pm$ 0.45	15.2 $\pm$ 0.41	16.4 $\pm$ 0.51	15.2 $\pm$ 0.41	5	5	5
15	48.6 $\pm$ 0.43	48.7 $\pm$ 0.45	49.7 $\pm$ 0.25	20.5 $\pm$ 0.75	23.3 $\pm$ 0.62	18.7 $\pm$ 0.51	15.1 $\pm$ 0.43	16.3 $\pm$ 0.41	14.8 $\pm$ 0.32	4.2	4.6	5
30	45.2 $\pm$ 0.51	46.06 $\pm$ 0.53	49.0 $\pm$ 0.31	26.2 $\pm$ 0.78	26.8 $\pm$ 0.71	23.2 $\pm$ 0.85	29.4 $\pm$ 0.68	28.5 $\pm$ 0.61	14.2 $\pm$ 0.39	3.0	3.6	5
45	46.3 $\pm$ 0.35	46.5 $\pm$ 0.28	48.8 $\pm$ 0.25	29.2 $\pm$ 0.84	28.8 $\pm$ 0.78	26.1 $\pm$ 0.81	22.4 $\pm$ 0.58	23.6 $\pm$ 0.52	16.5 $\pm$ 0.42	3.0	3.0	5
60	48.1 $\pm$ 0.43	48.6 $\pm$ 0.26	48.3 $\pm$ 0.21	35.4 $\pm$ 0.91	32.1 $\pm$ 0.79	29.3 $\pm$ 0.95	34.9 $\pm$ 0.72	30.8 $\pm$ 0.78	18.6 $\pm$ 0.61	2*	3.0	5
75	—	48.9 $\pm$ 0.27	48.1 $\pm$ 0.18	—	33.4 $\pm$ 0.81	30.1 $\pm$ 0.74	—	38.6 $\pm$ 0.81	13.8 $\pm$ 0.48	—	2.2	4.2

A10 - Immersed in brine for 7 days, pressed at 0.048 kg/cm² and packed in polythene bagA20 - Immersed in brine with 0.1% propionic for 7 days, pressed at 0.048 kg/cm² and packed in polythene bagA11 - Immersed in brine for 7 days, pressed at 0.048 kg/cm² and packed in Nylon/surllyn under vacuum

Table 4. Changes in vacuum packed salted pressed *Psenes indicus* during storage at ambient temperature (36+9°C) and RH (67+33%)

Storage in days	Total Volatile Base Nitrogen mg% (Mean±SD)						Peroxide Value, milli. equiv/kg of fat (Mean±SD)						Overall quality (Mean±SD)					
	A11	B11	C11	A21	B21	C21	A11	B11	C11	A21	B21	C21	A11	B11	C11	A21	B21	C21
0	15.3 ±0.51	16.1 ±0.42	18.2 ±0.65	19.9 ±0.68	15.9 ±0.54	14.5 ±0.43	15.23 ±0.41	13.96 ±0.35	14.28 ±0.38	16.49 ±0.51	15.91 ±0.45	15.50 ±0.48	5	5	5	5	5	5
30	23.2 ±0.85	28.4 ±0.76	24.6 ±0.62	28.5 ±0.82	27.0 ±0.71	24.1 ±0.63	14.20 ±0.39	12.30 ±0.36	11.34 ±0.32	14.31 ±0.43	14.56 ±0.49	17.51 ±0.54	5	5	5	5	5	5
60	29.3 ±0.95	31.4 ±0.89	30.1 ±0.79	28.8 ±0.76	29.1 ±0.84	29.9 ±0.88	18.61 ±0.61	21.21 ±0.68	19.04 ±0.65	17.83 ±0.59	21.70 ±0.64	25.01 ±0.68	4.2 ±0.4	4.2 ±0.4	4.0 ±0.0	4.6 ±0.5	4.2 ±0.4	4.2 ±0.4
90	32.1 ±0.75	34.1 ±0.83	34.0 ±0.94	32.8 ±0.87	33.1 ±0.91	34.6 ±0.96	7.51 ±0.25	9.32 ±0.28	20.03 ±0.65	15.38 ±0.53	17.21 ±0.67	25.8 ±0.69	3.0 ±0.0	3.2 ±0.4	3.2 ±0.4	3.2 ±0.4	3.6 ±0.5	3.2 ±0.4
120	35.1 ±0.74	36.1 ±0.89	37.5 ±0.94	35.6 ±0.88	36.3 ±0.91	37.3 ±0.98	Negli- gible	10.31 ±0.31	7.69 ±0.27	10.81 ±0.32	13.27 ±0.37		3.00 ±0.0	3.0 ±0.0	3.0 ±0.0	3.2 ±0.4	3.2 ±0.4	3.2 ±0.4
135	38.9 ±0.68	42.5 ±0.78	42.1 ±0.87	39.2 ±0.78	39.5 ±0.81	41.6 ±0.92							2.6 ±0.5	2.2 ±0.4	2.2 ±0.4	3.0 ±0.0	3.0 ±0.0	3.2 ±0.4
150	42.2 ±0.88	44.3 ±1.01	46.5 ±1.05	42.7 ±0.91	42.9 ±0.98	46.9 ±1.12							2.2 ±0.4	1.6 ±0.5	1.6 ±0.5	2.6 ±0.4	2.6 ±0.4	2.6 ±0.5

A - pressed at 0.048 kg/cm², B - pressed at 0.064 kg/cm² and C - pressed at 0.08 kg/cm²

A11 - B11 - C11 immersed in saturated brine for 7 days, pressed and packed in Nylon/surlyn under vacuum

A21 - B21 - C21 immersed in saturated brine containing 0.1% propionic acid for 7 days and packed in Nylon/surlyn under vacuum

salted fish cake (with 27% salt) from whiting was acceptable for eight months at ambient temperature.

Table 4 shows that vacuum packed fish were acceptable upto 120 to 135 days and ordinary polythene packed products were acceptable for 45 to 60 days. Visible growth of red halophiles was not found on surface of any vacuum packed fish. During long storage the propionic acid treated fish was better than untreated fish organoleptically. The cut surface and meat of vacuum packed, pressed and salted fish became white to brown in all the cases during storage, but the development of discolouration in propionic acid treated fish was comparatively slower. Moisture content of the products varied from 49.6 to 51.3% before storage and the same varied from 47.17 to 49.5% after 4¹/₂ months storage. Slow reduction in moisture content and accumulation of drip in all vacuum packets were noticed during long storage. TVBN increased in all vacuum packed products during storage; but PV increased slowly and then decreased in all products during storage. Akande *et al.* (1988) reported similar results during storage of salted dried fish cakes from mackerel.

The authors are thankful to the Director, Central Institute of Fisheries Technology, Kochi-29 for permission to publish this paper. Technical assistance of Shri A.V. Anjaneyulu and Shri N. Venkata Rao is gratefully acknowledged.

References

AOAC (1975) *Official Methods of Analysis* (Horwitz, W., Ed.) 12th edn., Association of Official Analytical Chemists, Washington

Akande, G.R., Knowles, M.J. & Taylor, K.D.A. (1988) *Int.J. Fd Sci.Tech.* **23**, 495

Conway, E.J. (1947) *Microdiffusion Analysis and Volumetric Error*, Crossby, Lockwood and Sons, London

Hiremath, G.G., Sudhakara, N.S. & Shetty, H.P.C. (1985) in *Harvest and Post-harvest Technology of Fish* (K.Ravindran, N.Unnikrishnan Nair, P.A.Perigreen, P.Madhavan, A.G.Gopalakrishna Pillai, P.A.Panicker & Mary Thomas, Eds.), Society of Fisheries Technologists (India), p.513

Hiremath, G.G., Serrao, A.D., Parthapachandra, T.N. & Setty, T.M.R. (1987) in *Recent Trends in Processing Low Cost Fish* (K.K.Balachandran, P.A.Perigreen, P.Madhavan & P.K.Surendran, Eds.) Society of Fisheries Technologists (India), Cochin, p.48

King, D., Kamara, V.A. & Wood, C.D. (1982) in *Proceedings of symposium held in conjunction with sixth session of the Indo-Pacific Fishery Commission Working Part on Fish Technology and Marketing* (A.Reilly, Ed.), FAO Fish rep., 317, pp.271

Lima dos Santos, C.A.M. (1977) in *Handling, Processing and Marketing of Tropical Fish*, Tropical Products Institute, London

Mendelsohn, J.M. (1974) in *Fishery Products* (Kreuzer, R., Ed.) FAO, Fishing News (Books) Ltd., Surrey, England, 301

Stokes, R.H. & Robenson, R.A. (1974) *Industrial Engineering Chemistry*, **41**, 2013