

Quality of Cured Fish from the Maharashtra Coast

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Chemical, bacteriological and organoleptic characteristics of sun dried/dry salted fish collected from five major centres of coastal Maharashtra are reported. Wide variations are seen in the quality of the different samples. In dry salted products, moisture ranged from 16.17 to 46.58%; salt from 5.18 to 22.75%; acid insoluble ash from 1.0 to 6.83%. In sun dried samples moisture varied from 16.15 to 39.51% and acid insoluble ash from 0.42 to 2.82%. The sun dried samples, though no salt was used in the process, showed fairly good amount of salt.

Maharashtra coast is well known for cured fish products. Ratnagiri and Malvan were once famous for Colombo curing and mona curing (Nicholson, 1925). Sorley (1933) reported that in 1930-31 about 33 curing yards were operating in the area producing about 10,000 t of sun dried, dry salted and wet cured fish. Bains Prashad (1943) observed that the conditions of curing prevailing on the coast were unhygienic and unsanitary. But the attempts to assess the quality of the products were made only in recent times (Pillai *et al.*, 1956; Pillai & Kamasastri, 1958; Srinivasan *et al.*, 1967; George Joseph *et al.*, 1983). This paper reports the chemical, bacteriological and organoleptic characteristics of cured fish produced in the Maharashtra coast.

Materials and Methods

A total of 358 samples of sun dried and dry salted fish were collected from the curing centres of Malvan, Vijayadurg, Ratnagiri, Padava and Bombay. The general conditions of the curing yards and the methods preparations were noted at each centre. About 500 g each of samples were collected and were analysed for moisture, sodium chloride and acid insoluble ash according to AOAC (1980). Total bacterial count (TPC) was determined by the method des-

cribed by George Joseph *et al.* (1983). Presence of 'red' halophiles was tested using milk salt agar medium (Dussault and La Chance, 1952). The medium was poured into petridishes and allowed to solidify. The plates were kept for 24 h at 5°C. A known amount of the fish extract was spread over the milk salt agar medium and incubated at ambient conditions. Development of red colonies was taken as positive for the presence of 'red'.

Results and Discussion

The survey indicated that Colombo cured, wet cured and mona cured products are not presently turned out in the area. The curing methods practised are sun drying and dry salting. The method of handling the fish was still unhygienic and almost primitive. The fish was carried from landing centres to the curing yards in palmyrah baskets and were heaped on the floor. Very often the fish used was damaged and spoiled. None of the yards except some in Bombay had running water facility. No consideration for proper disposal of waste was given especially in Malvan, Padava and Vijayadurg.

The sun dried samples collected were either too dry or too crumbled where the flesh was found as loose flakes (Table 1.) Most of the samples were contaminated with sand because of drying on sandy beach. Fish was often dried only on one side resulting in case-hardening on that side while the other

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Table 1. Physical and organoleptic characteristics of the cured fish samples

Sample	Type of curing	Centre	Type of spoilage	Organo-leptic score
Sardine	A	Malvan	Brown discolouration and rancidity. No uniform drying. Dressing not proper. Sand present. 'Red' in some of the fish. Shrinkage of material	1
Sardine	A	Vijayadurg	Brown discolouration. Rancid. Drying not uniform. Salt crystals present. Sand present. Shrinkage	1
Sardine	A	Ratnagiri	Case hardening. Crumble on handling. Discoloured, Rancid	2
Lactarius	A	Malvan	Dull colour. Sand present. 'Red' present	3
Lactarius	A	Vijayadurg	Dull appearance. 'Red' present	3
Prawn	A	Malvan	Dull brown colour. Some pieces crumble. 'Red' on most samples	2
Prawn	A	Vijayadurg	Dull appearance. Crumbling observed. 'Red' present	2
Prawn	A	Bombay	Some fish crumbled on handling. Good appearance	3
Prawn	A	Padava	No uniform drying. Appearance not good	2
Ribbon fish	A	Ratnagiri	Dark appearance. Rancid. Slimy surface. Maggots present. Red on all	0
Ribbon fish	B	Padava	No uniform drying; dark appearance; flesh in flakes with mold in between	0
Sole	A	Ratnagiri	Dark colour. Some pieces emanating off odour. Sand contaminated shrinkage of material	1
Shark	A	Padava	Dull and poor appearance. Strong ammonia smell. Hard flesh surface. Red present	0
Catfish	A	Padava	Poor appearance. Hard crust on surface. Interior moist. Red is present	1
Dhoma	B	Padava	Drying not uniform most fish crumbled. Sand present	2
White baits	B	Bombay	Yellowish colour; crumbling observed; white patches of 'burn' on most pieces	2
Bombay duck	B	Bombay	Good appearance, better dried, 'Red' is present on some	4
Bombay duck	B	Padava	Dull appearance; not uniformly dried; 'Red' on some pieces	1
Pomfret	B	Padava	Dull appearance; no uniform drying; flesh in some in flakes with stray white patches	1
Pomfret	B	Bombay	Better appearance but drying not uniform. 'Red' is present	3

Organoleptic rating: 0 = poor; 1 = fair - poor; 2 = fair; 3 = fair - good; 4 = good; 5 = very good; A = salted and dried; B = sun dried.

Table 2. Chemical characteristics of cured fish samples

Name of samples	Centre	No. of samples analysed	Moisture %		Salt % DWB		Acid insol. ash % DWB		'Red' in % of sample
			Average	Range	Average	Range	Average	Range	
Sardine	Malvan	18 A	36.47	34.72-38.84	19.44	17.95-21.52	3.195	2.57-4.67	50
Sardine	Vijayadurg	18 A	35.16	34.48-39.38	18.96	16.55-21.07	2.959	2.18-4.27	—
Sardine	Ratnagiri	18 A	31.57	27.38-34.89	21.24	19.84-22.75	3.078	2.03-3.91	—
Lactarius	Malvan	21 A	40.70	37.50-46.35	19.29	17.40-21.91	4.523	3.25-5.87	100
Lactarius	Vijayadurg	21 A	42.12	38.38-45.54	19.45	17.59-22.08	4.519	3.17-5.16	100
Prawn	Malvan	15 A	22.52	21.73-23.56	7.59	7.10-8.07	1.903	1.04-2.85	80
Prawn	Vijayadurg	15 A	23.01	21.94-23.95	8.01	7.36-8.68	2.271	1.64-3.10	80
Prawn	Padava	12 A	18.95	16.17-22.37	7.056	5.80-8.41	2.803	1.39-4.11	67
Prawn	Bombay	15 A	25.33	18.50-38.52	7.864	6.44-9.85	1.861	1.07-2.81	67
Ribbon fish	Ratnagiri	15 A	42.37	39.53-46.58	18.08	16.53-19.82	6.084	4.41-6.83	100
Sole	Ratnagiri	21 A	20.01	17.35-23.71	19.87	18.37-21.87	1.910	1.20-2.52	—
Shark	Padava	15 A	32.29	28.37-39.51	12.27	7.06-19.00	1.873	1.25-2.50	60
Catfish	Padava	18 A	24.42	18.38-28.02	6.59	5.18-8.19	2.136	1.29-3.20	100
Ribbon fish	Padava	27 A	19.65	16.15-24.86	2.00	1.21-2.92	1.129	0.42-1.98	44
Bombay duck	Padava	16 B	25.07	22.31-27.49	6.08	5.24-7.18	1.661	1.12-2.26	69
Bombay duck	Bombay	35 B	21.30	17.35-27.03	7.26	5.19-9.30	1.941	1.14-2.75	57
Pomfret	Padava	9 B	18.34	16.94-19.54	2.86	2.23-3.39	1.861	1.33-2.00	—
Pomfret	Bombay	10 B	22.94	1.93-25.62	2.01	1.30-2.59	1.358	1.02-1.73	100
Dhoma	Padava	15 B	23.94	20.38-27.18	4.95	4.19-6.00	1.661	1.05-2.23	67
White bait	Bombay	24 B	19.01	16.39-22.01	5.075	4.06-6.30	2.103	1.50-2.82	100

A = dry salted; B = sun dried; DWB = dry weight basis

parts remained wet. The samples showed wide variations in chemical quality (Table 2). In the sun drying process salt is not used. However the high salt observed may be from the floor of the curing sheds where it was stacked or from the beach where salted fish has been dried on previous occasions. Samples of Bombay duck from Bombay showed an average salt content as high as 7.26% while the samples from Padava showed an average content of 6.08%.

In dry salting salt is added indiscriminately without any proportion. There was no specific duration of salting. Market demand often influenced the processing time. The condition of dry salted samples at the time of collection is given in Table 1. Brown discolouration and case hardening were prominent especially in the sardine samples.

Table 2 summarises the variations in the quality parameters studied. Moisture varied between 16.18 and 46.58%. Salt content also varied widely, ranging between 5.18 and 22.75%. The insolubles were high in most samples.

The TPC are given in Table 3. While 4.19% of samples had high bacterial load as is seen by the TPC, 95.81% of the samples fell within a TPC of 10^2 and 10^5 . 62.01% of the sample showed presence of 'red'.

Table 3. Bacteriological characteristics of cured fish samples

TPC	% of samples
Upto 10^2	22.906
10^2 to 10^3	42.458
10^3 to 10^4	19.273
10^4 to 10^5	11.173
10^5 to 10^6	4.189

The poor quality of the samples observed is as a result of improper handling and unscientific curing practice. Inadequate facilities

for icing the fish prior to processing, non-availability of potable water and improper disposal of waste are the other factors. Elevated platforms for drying should be employed to prevent contamination. Better awareness of hygienic and sanitary practices will improve the quality of the products.

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