Quality Characteristics of Cured Fish of Commerce ✓

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A survey was conducted at the fish curing yards at Shakthikulangara (Quilon), fish market at Vizhinjam, fish curing yards, fish market as well as dry fish godowns in and around Tuticorin. A total of 23 samples of different varieties of fishes collected from the markets and curing yards and 8 samples of anchovies collected from different godowns at Tuticorin were analysed to evaluate the quality and extent of fungal and insect infestation. Samples were analysed for proximate composition and estimated their water activity. About 70% of the 23 samples of different varieties of fish were found to be unfit for consumption and 12.5% of the samples of anchovies were found to be infested with beetle, after 3 weeks of storage after collection from these centres.

In India, the cured fish products have good internal market and they are also being exported in sizeable quantities to countries like Sri Lanka, Hong Kong, Singapore etc. The export of dried fish products have increased from 3.32% in 1982–83 to 7.00% in 1983–84 quantitywise and from 0.58 to 1.44% valuewise, of the total marine products exported (Anon, 1984).

Spoilage can occur at all stages of processing. The occurrence of spoilage in dry fish depends on the temperature and water activity of the fish and the presence or absence of the various spoilage organisms and insects (Doe, 1982). Water activity of the product provides a means for estimating the storage life under tropical conditions (Doe *et al.*, 1982) Hence the periodical quality evaluation of cured fish products and suggestion for improvement have become a necessity for the growth of fish curing industry in India.

A survey had been conducted by Srinivasan and Joseph (1966) on the quality of salt cured fish in Kanyakumari District, during 1963–64. Very recently George Joseph *et al.* (1983) had studied the quality of cured fishery products from Malabar and Kanara coasts. But none of the above works mention the estimation of water activity of the product and its relation to spoilage. Hence an experiment was carried out to study the curing methods adopted at various centres and to evaluate the quality of dried salted fish, stress being given to relate the water activity of the samples to their spoilage.

Materials and Methods

The fish curing yards, fish markets and dry fish godowns were visited during the first week of June 1984. Shakthikulangara (Quilon), Vizhinjam, Kanyakumari and Tuticorin were the places covered under this survey. Basic data were collected on the species used for curing, curing practices followed and methods of disposal of the final product.

Methods of preparation of dry fish was observed to be almost common in these centres. Big fishes, split open along the dorsal side and with several deep cuts made lengthwise, or the whole fish as such when the size is small are washed and mixed with about 25% of salt and placed inside cement tanks of size 2 m x 1.5 m x 1 m. The amount of salt used is not in definite proportion to the fish but only an approximate quantity is added, care being taken that there is excess salt present. Subsequently when more fishes are available during peak season they are also introduced into the tank and salt is also added

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to the self brine already formed. Fishes are allowed to remain in the tanks for a minimum period of 16 h. When there is demand, fish is taken out and dried for a day in bright sunlight or for two or more days during cloudy days. Drying is done over cement platform or coir mats. The final product is packed in palmyrah leaf basket or coconut leaf basket and transported to dry fish markets. Dried fish samples were collected at random from these centres so that different species were incorporated in the analysis. The samples were packed in polythene bags and brought to the laboratory for analysis. Moisture, salt, fat, protein and ash were estimated according to AOAC (1980). Water activity was determined using the method of Doe *et al.* (1982). Physical observation was made for the extent of spoilage by mould, bacteria and insect and the quality inspection table was prepared by the method described by Wood (1984).

Results and Discussion

The values of moisture, protein, fat, salt, total mineral ash and water activity of 23 samples of various species of fishes are presented in Table 1. Table 2 gives the details of quality inspection of these samples. Moisture, salt and total mineral ash and water activity of 8 samples of anchovies collected from dry fish godowns are given in Table 3.

From Table 1 it is noted that out of the 23 samples, 7 samples had moisture content above 51% a value higher than the ISI Standards (IS: 2882, 1964; IS: 5198, 1969; & IS: 2883, 1976), which prescribe a range of 10 to 35% moisture normally and 40 to 45% moisture in respect of certain big fishes (Gopakumar & Devadasan, 1981). All the 7 samples were unacceptable after storage for about 3 weeks. The storage life pattern agrees to the results of Poulter (1980) on the good quality storage life of dried fish with

Table 1. *Proximate composition and water activity of different varieties of dried fish*

Name of species	Place of collection	Moisture %	Protein % WWB	Fat % WWB	Salt % WWB	Total mineral ash % WWB	Water activity a_w
Saurida tumbil	Shakthikulangara	54.04	19.12	5.87	17.88	20.97	0.78
Muraenesox sp.	,,	51.49	18.03	11.98	14.01	18.50	0.82
Cynoglossus macrostomus	,,	47.75	27.03	6.49	19.36	18.46	0.75
Saurida tumbil	,,	52.88	19.12	9.16	16.92	18.84	0.78
Tachysurus spp.	,,	52.34	20.32	10.19	17.20	17.15	0.77
Sardinella longiceps	Vizhinjam	51.13	17.19	11.60	21.60	20.08	0.79
Tachysurus sp.	,,	58.04	18.78	4.04	21.13	19.14	0.81
Anchoviella heterolobus	,,	24.81	39.77	7.56	11.12	27.86	0.14
Caranx kalla	,,	37.45	27.13	16.05	14.86	19.37	0.75
Caranx sp.	,,	54.85	27.36	6.11	10.61	11.68	0.88
Loligo sp.	,,	25.72	46.23	12.20	1.43	15.85	0.95
Pellona sp.	Tuticorin	31.51	46.12	8.25	8.53	14.12	0.82
Chorinemus sp.	,,	31.80	42.02	10.04	11.78	16.14	0.76
Sardinella sp.	,,	25.59	40.84	12.27	13.08	21.30	0.75
Otolithus ruber	,,	18.93	52.10	8.33	15.65	20.64	0.71
Lutjanus sp.	,,	42.02	33.10	9.17	13.67	15.71	0.73
Leiognathus sp.	,,	26.22	44.87	10.14	12.19	18.77	0.74
Caranx sp.	,,	17.06	53.35	10.69	14.55	18.91	0.70
Leiognathus bindus	,,	14.11	50.30	13.33	15.14	22.26	0.68
Anodontostoma chacunda	,,	27.73	37.68	17.76	11.48	16.82	0.75
Scomberomorus commersoni	,,	30.89	34.91	10.55	16.74	23.65	0.75
Sphyraena jello	,,	28.99	37.43	9.22	17.74	24.37	0.75
Katsuwonus pelamis	,,	12.34	78.55	3.72	2.15	7.35	0.63

Table 2. *Quality inspection table of 23 varieties of dried fish*

Species	Size range (cms)	Holes in sides	Hollow	Fly	Beetle	Fungus/ mould	Level of unacceptability
Saurida tumbil	20–30	+		+		+	++
Muraenesox sp.	85			++			+++
Cynoglossus macerostomus	7–12						++
Saurida tumbil	11–20		+				++
Tachysurus sp.	20–25					++	+++
Sardinella longiceps	15			+			++
Tachysurus sp.	17					++	+++
Anchoviella heterolobus	7–10				++		++
Caranx	10–15						+
Caranx sp.	15–20			+++			+++
Loligo	10–15					+	+
Pellona sp.	10–15						
Chorinemus sp.	30						
Sardinella sp.	18						+
Otolithus ruber	43						
Lutjanus sp.	10–20						
Leiognathus sp.	8–12					++	+++
Caranx	10–12						++
Leiognathus bindus	10–12						++
Aodontostoma chakunda	15–20					+	++
Scomberomorus commersoni	8–10						
Sphyraena jello	15–20						
Katsuwonus pelamis	20						
No. of samples with quality defect		1	1	4	1	6	16
% of samples with quality defect		4.34	4.34	17.39	4.34	26.08	69.56

\+ Moderate; ++ Significant, +++ Excessive

Table 3. *Proximate composition and water activity of dried anchovies, collected from various dry fish godowns at Tuticorin*

Sl. No.	Moisture %	Protein % WWB	Fat % WWB	Salt % WWB	Total mineral ash % WWB	Water activity
1	15.03	63.00	8.20	0.97	17.30	0.81
2	14.26	58.55	12.06	0.94	18.89	0.81
3	13.55	61.60	10.54	0.64	15.13	0.79
4	14.93	58.70	9.27	1.29	19.47	0.79
5	15.43	61.95	11.58	1.30	10.63	0.82*
6	15.50	59.20	10.45	2.13	14.24	0.79
7	15.42	64.30	7.02	2.08	20.68	0.76
8	14.00	59.45	10.56	1.93	18.65	0.76

* Infested with beetle

different salt and water contents. In the case of 8 samples of anchovies moisture content ranged from 13.5 to 15.5% which is within the limits of ISI specification for white baits (IS: 2883, 1976). All the samples kept well after 3 weeks of storage.

ISI standards prescribe salt levels upto 2.5% in the case of anchovies and 30% in the case of seer. (IS: 5198, 1969 and IS: 2883, 1976). Most of the samples do not conform to the ISI levels of salt (IS: 594, 1962). Because of inadequate salting and moisture levels. the products have become easily unacceptable (Poulter, 1980).

Spoilage of dried fish may be due to bacterial, fungal or yeast action, rancidity, autolysis, browning and other reactions all of which are temperature and water activity dependent (Doe, 1982). Traditional processes preserve fish by reducing a_w. At a_w 0.6 or below all microbial growth is inhibited, but an a_w above this microorganisms slowly damage the product. At a_w levels below 0.85 development of bacteria and yeasts is normally arrested and halophilic bacteria, xerophilic moulds and osmophilic yeasts predominate which may attack the cured products (Parry & Pawsey, 1973). Quality inspection table (Table 2) shows that 6 samples that have been affected with mould and fungus, extensively had a_w of 0.75, 0.74, 0.95, 0.81, 0.77 and 0.78. This is in agreement with the views of Parry and Pawsey (1973).

Quality inspection of 23 samples showed that about 17% of the samples were infested with blow fly, about 4% with beetle and about 26% with fungi. About 4% of the samples were hollow and about 4% were affected with holes. Totally about 70% of the samples became unacceptable after 3 weeks of storage after collection. This has good relation to the a_w of the samples which ranged from 0.63 to 0.95. The samples found unacceptable were having high a_w.

Anchovies samples had a_w ranging from 0.63 to 0.82 (Table 3). The quality inspection of anchovies showed that only 12.5% of the samples was infested with *Necrobia rufipes*. Since the a_w of the product was comparatively low the product could keep well for more than 3 weeks, without any spoilage.

Strict quality control in terms of a_w is to be imposed and better hygienic conditions in the curing yards are to be encouraged for the uplift of curing industry and for the production of good quality product and for reducing the losses in curing processes.

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