

Chemical and Microbiological Quality of Dry Fish from Kakinada

M.M. Prasad, C.C. Panduranga Rao and S.S. Gupta

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

Chemical and microbiological qualities of 75 samples of dry fish from local markets were studied. In most of the samples, moisture content was found to be higher and salt content lower as compared with ISI specifications for cured dried fish. Potential pathogens, *Escherichia coli* and coagulase positive staphylococci, were isolated from some of the samples.

Salt curing and drying are traditional methods of utilisation of fish and play an important role in the socio-economic system of small scale fishermen. Utilisation of fish in cured/dried form in this country ranks next only to fresh fish and hence dry fish has received much attention of research workers (Rao *et al.*, 1962; Sreenivasan & Joseph, 1966, Kalaimani *et al.*, 1988). Information on the quality of cured/dried fish in this region has been scanty and hence the present study was undertaken.

Materials and Methods

Seventy five samples of cured/dried fish belonging to 24 varieties, collected from the local fish markets were employed in this study. Total bacterial counts and coliform counts of the samples were determined according to the method of Thatcher & Clark (1978). Faecal streptococci and *Escherichia coli* in samples were determined employing the methods described by Speck (1976). *Staphylococcus aureus* counts in the samples were determined by employing the method of Bennett (1984). Moisture content and salt were estimated as per AOAC (1980) methods and Total Volatile Nitrogen (TVN) according to the method of Conway (1947). All samples analyses were done in triplicate.

Results and Discussion

Moisture, salt and TVN content of the

dry fish samples in the present study are presented in Table 1. Dried mackerel and sciaenid samples were found to contain more moisture and less salt as compared to ISI standards (IS: 4302, 1967; IS: 3850, 1973). In respect of seer fish, moisture content was nearly the same as required in ISI specifications, but salt content was less (IS: 5198, 1969). Anchovies contained higher moisture and salt than ISI specifications IS: 2883, 1976).

A perusal of Table 2 shows that as many as 88 percent of the samples possessed less than 20 percent salt which agrees with previous reports (Joseph *et al.*, 1986; Basu *et al.*, 1989). Similarly, 32.4 percent of the dry fish samples in the present study were found to possess moisture level of less than 40 percent. The majority of the dried fish samples available in the local market contained more than 40 percent moisture and less than 20 percent salt. Non acceptability of the products due to lower salt and higher moisture levels was discussed by Poulter (1980).

The lowest and highest levels of total volatile nitrogen (TVN) observed were 66.8 and 244.0 mg% of the muscle in spotted croaker and flat headed grey mullet respectively (Table 1). Basu *et al.* (1989) have reported a lowest TVN value of 89.7 mg% of muscle in mullets and a highest TVN value of 426.7 mg% in pomfrets during their studies on quality of dry fish from Andhra

Table 1. Chemical parameters of quality

Species	No. of samples	Moisture %	TVN mg %	Salt %
Ribbon fish (<i>Trichurus haumela</i>)	6	38.75 (28.10-43.38)	131.73 (66.86-184.34)	13.41 (7.66-23.86)
Ribbon fish (<i>Lepturacanthus savala</i>)	2	31.70 (26.42-36.99)	125.12 (121.31-128.92)	16.16 (14.6-17.72)
Spotted croaker (<i>Protonibea diacanthus</i>)	8	43.75 (36.34-50.00)	155.09 (66.83-229.88)	16.51 (7.13-27.49)
Dussumier's croaker (<i>Johnius dussumieri</i>)	11	43.14 (40.0-46.74)	188.94 (172.87-201.15)	15.15 (7.91-26.44)
Sciaenids	1	39.46	154.24	9.10
Indian oil sardine (<i>Sardinella longiceps</i>)	3	41.66 (38.0-46.0)	138.96 (128.26-156.29)	12.03 (11.5-12.80)
Flat head grey mullet (<i>Mugil cephalus</i>)	7	43.32 (35.36-47.45)	175.48 (128.21-244.01)	14.63 (11.37-18.49)
Spiegler's grey mullet (<i>Valamugil speigleri</i>)	4	43.61 (39.40-46.53)	183.49 (161.1-215.4)	11.28 (9.94-12.45)
Indian ariomma (<i>Ariomma indica</i>)	2	47.57 (44.01-51.13)	246.0 (212.0-280.0)	17.89 (10.50-25.30)
False trevally (<i>Lactarius lactarius</i>)	2	44.78 (40.35-49.20)	168.95 (158.49-179.40)	9.68 (7.66-11.69)
Indian threadfin (<i>Polydactylus indicus</i>)	4	41.93 (39.58-44.18)	149.22 (99.65-200.15)	12.41 (8.33-15.18)
Anchovies (<i>Engraulis</i> spp.)	5	16.82 (15.83-18.29)	102.00 (78.15-153.42)	3.81 (3.16-5.27)
Hamilton's thryssa (<i>Thryssa hamiltoni</i>)	1	38.42	210.10	12.45
Chinese pomfret (<i>Pampus chinensis</i>)	5	33.79 (12.48-42.92)	157.37 (83.75-239.13)	13.498 (6.67-19.12)
Banded barracuda (<i>Sphyraena jello</i>)	3	34.33 (28.48-42.33)	172.64 (132.54-200.00)	15.73 (8.18-28.39)
Indo-Pacific spanish mackerel (<i>Scomberomorus guttatus</i>)	2	46.40 (42.22-50.58)	130.60 (113.18-148.01)	11.84 (10.35-13.36)
Narrow barred Spanish mackerel (<i>Scomberomorus commerson</i>)	1	49.51	150.31	12.33
Indian halibut (<i>Psettodes erumei</i>)	2	35.42 (32.90-39.94)	160.69 (148.07-173.31)	10.245 (9.49-11.0)
Greater lizard fish (<i>Saurida tumbil</i>)	1	43.55	185.56	11.94
Tongue soles (<i>Cynoglossus</i> spp.)	1	27.77	166.51	13.36
Caranx	1	41.79	242.52	10.55
Silver sillago (<i>Sillago sihama</i>)	1	40.51	215.35	11.40

Pradesh. Studies on quality of cured fish from Tamil Nadu coast reported TVN values ranging from 29.9 to 112.5 mg% (Joseph *et al.*, 1986). Though no maximum permissible limit has so far been fixed for TVN content of cured fish, studies have suggested a TVN value of 200 mg% as the acceptable limit (Venkataraman & Vasavan, 1959; Sreenivasan & Joseph, 1966). High values of TVN were reported to correlate with high bacterial activity (Vanderzant *et al.*, 1973).

In comparison with published standards for dry fish 84 percent of the samples were found to possess TVN below 200 mg%. There is need for determination of acceptable TVN levels for cured/dry fish since high TVN values denote high spoilage resulting in non acceptability of the product for human consumption (Joseph *et al.*, 1983).

The total bacterial counts (TBC) reported in this study ranged from 10^3 to 10^6 organisms per gram of the sample (Table 3), which was observed in the samples of Tamil Nadu coast (Joseph *et al.*, 1986), Maharashtra coast (Joseph *et al.*, 1988) and Andhra Pradesh coast (Basu *et al.*, 1989) as well. In this study coliforms were present in 17 samples, *E. coli* in six samples, faecal streptococci in five samples and coagulase positive staphylococci in two samples (Table 3). *E. coli*, faecal streptococci and coagulase positive staphylococci were not recovered in the earlier studies (Joseph *et al.*, 1986; Basu *et al.*, 1989). However Basu *et al.*, (1989) reported the presence of coliforms in 80 percent of the dry samples.

The present study indicates that most of the dry fish samples obtained from this area do not conform to ISI standards.

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Table 2. Range of moisture, salt and TVN in the samples

	Moisture, %			Salt, %				TVN, mg N%		
	Below 30	30 to 40	Above 40	Below 10	10-15	15-20	Above 20	Below 100	100-200	Above 200
Percentage of samples	13.33	18.66	68	24	52	12	12	9.33	74.66	16

Table 3. Bacteriological analysis of dry fish samples (count expressed as log cfu g⁻¹)

Name of the fish	TBC	Coli-forms	<i>E. coli</i>	Faecal streptococci	Coagulase +ve Staphylococci
<i>Trichiurus haumela</i>	5.76	4.30	1.43	2.77	NR
<i>Lepturacanthus savala</i>	4.25	3.90	NR	NR	NR
<i>Protonibea diacanthus</i>	5.15	3.87	1.57	NR	NR
<i>Johnius dussumieri</i>	6.64	3.64	NR	NR	3.80
Sciaenids	3.55	2.77	NR	NR	NR
<i>Sardinella longiceps</i>	3.90	3.00	3.30	NR	NR
<i>Mugil cephalus</i>	5.68	3.69	NR	4.14	2.30
<i>Valamugil speigleri</i>	7.38	3.07	NR	NR	NR
<i>Rastrelliger kanagurta</i>	3.53	NR	NR	NR	NR
<i>Ariomma indica</i>	4.14	3.85	2.47	NR	NR
<i>Lactarius lactarius</i>	5.55	4.77	NR	2.34	NR
<i>Polydactylus indicus</i>	4.55	3.66	NR	NR	NR
<i>Engraulis</i> spp.	3.46	NR	NR	NR	NR
<i>Thyssa hamiltonii</i>	ND	ND	ND	ND	NR
<i>Pampus chinensis</i>	4.77	2.55	NR	NR	NR
<i>Sphyræna jello</i>	3.59	NR	NR	NR	NR
<i>Scomberomorus guttatus</i>	6.77	2.71	NR	NR	NR
<i>Psettodes erumei</i>	3.30	NR	NR	NR	NR
<i>Scomberomorus commerson</i>	5.00	3.90	2.55	3.84	NR
<i>Saurida tumbil</i>	3.97	2.77	NR	NR	NR
<i>Cynoglossus</i> sp.	3.53	NR	NR	NR	NR
<i>Caranx</i> sp.	6.90	5.71	2.60	3.60	NR
<i>Sillago sihama</i>	ND	ND	ND	ND	NR

NR = not recovered; ND = not done

References

- AOAC (1980) *Official Methods of Analysis*, 13th edn., Association of Official Analytical Chemists, Washington D.C., USA
- Basu, S., Imam Khasim, D., Gupta, S.S. & Panduranga Rao, C.C. (1989) *Fish. Technol.* 26, 114
- Bennet, R.W. (1984) *Bacteriological Analytical Manual* 6th edn., Association of Official Analytical Chemists, Arlington, USA
- Conway, E.J. (1947) *Microdiffusion Analysis and Volumetric Error*, Crossby, Lock Wood and Sons, London, UK
- Francis Thomas & Balachandran, K.K. (1989)

in *Recent Trends in Processing Low Cost Fish*, p.1-10, Society of Fisheries Technologists (India), Cochin

ISI (1967) *Indian Standard Specification for Dry Salted Mackerel*. IS: 4302, Indian Standard Institution, New Delhi, India

ISI (1969) *Indian Standard Specification for Dry Salted Seer Fish*, IS: 5198, Indian Standard Institution, New Delhi, India

ISI (1973) *Indian Standard specification for Dry Salted Threadfin. (Dara) and Dry Salted Jew Fish (Ghol.)*. IS: 3850 Indian Standard Institution, New Delhi, India

ISI (1976) *Indian Standard Specification for Dried White Baits*. IS: 2883, Indian Standard Institution, New Delhi, India

Joseph, K.G., Muraleedharan, V. & Nair, T.S.U. (1983) *Fish. Technol.* 20, 118

Joseph, K.G., Muraleedharan, V., Kalaimani, N. & Nair, T.S.U. (1986) *Fish. Technol.* 23, 63

Joseph, K.G., Muraleedharan, V., Nair, T.S.U. & Kalaimani, N. (1988) *Fish. Technol.* 25, 120

Kalaimani, N., Gopakumar, K. & Nair T.S.U. (1988) *Fish. Technol.* 25, 54

Muraleedharan, V., Unnithan, G.R., George Joseph, K. & Nair, T.S.U. (1989) *Fish. Technol.* 26, 30

Poulter (1980) *FAO Report No. 219*, p.22, FAO, Rome

Speck, M.L. (1976) *Compendium of Methods for the Microbiological Examination of Foods*, American Public Health Association, Washington DC, USA

Rao, S.V.S., Valsan, A.P., Kandoran, M.K. & Nair, M.R. (1962) *Indian J. Fish* 9(2b), 156

Srinivasan, R. & Joseph, K.G. (1966) *Fish. Technol.* 3, 103

Thatcher, F.S. & Clark, D.S. (1978) *Microorganisms in Foods*. 2nd edn., University of Toronto Press, Toronto, Canada

Venkata Raman, R. & Vasavan, A.G. (1959) *Madras Fisheries Station Reports and Year Book*, 1955-56, p.261

Vanderzant, C., Cobb, B.F. & Thomson, C.A. (Jr.) (1973) *J. Milk Food Technol.* 35, 443