Quality of Dry Fish from Markets in Andhra Pradesh

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Dry fish samples were procured from different fish markets and subjected to biochemical and bacteriological evaluation for assessing quality. The quality of market samples was compared with the samples dried in laboratory and in the mechanical drier. Most of the market samples had high moisture and sand contents. TVN values of market samples were high showing poor quality of the finished product.

Curing and drying has been a traditional method of preservation of fish along Andhra coast. Quality of dried fish along east and west coast was studied by many workers (Joseph *et al.*, 1983, 1986; Rao *et al.*, 1962; Joseph & Srinivasan, 1967; Srinivasan & Joseph, 1966). This paper reports the qaulity of dried fish available from the fish markets in East Godavary District of Andhra Pradesh. The quality of the commercially dried fish was compared with tunnel dried fish and sun dried fish prepared in the laboratory.

Materials and Methods

One hundred and twenty four samples of dried fish were collected from different dry fish markets of East Godavari District. Fish samples dried in tunnel drier were procured from Integrated Fisheries Project, Cochin (I.F.P.). Fresh samples of fish collected from the landing centres were eviscerated, split-opened, washed and dry salted overnight and dried in sun. All dried samples were analysed within 7 days of collection/ preparation. Total volatile nitrogen was estimated by the method of Conway (1947); moisture, salt and insoluble ash content were determined according to the methods of AOAC (1980). Total bacterial count was determined by standard pour plate method using Triptone Glucose Agar (TGA). Plates were incubated at 37°C for 48 h and counts taken. Coliforms were determined using deoxycholate agar, *E. coil* using Tergitol-7 agar, faecal streptococci using K. F. agar and coagulase positive staphylococci using Baird Parker agar (FDA, 1973; Difco, 1971). Total bacterial count was also determined using 10, 15 and 20% salt in TGA medium for samples with salt content between 7.5 & 12.6, 12.6 & 17.5% and 17.6 & 22.5% respectively.

Results and Discussion

Table 1 presents the results of chemical, bacteriological and organoleptic analysis of the dry fish samples. Percentage of samples having different ranges of moisture, salt and acid insoluble ash are grouped in Table 2. Examination of the Tables revealed that only 30% of the commercial samples had moisture content within the limits of ISI (1967) specifications. A few commercial samples (15%) had salt content within limits whereas all samples had acid insoluble ash above the limits. The salt and acid insoluble ash of tunnel dried samples were below the limits, but the laboratory dried samples had marginally higher acid insoluble ash. The higher content of ash in the laboratory dried samples may be due to the deposition of sand by wind during drying.

Analysis of data presented in Tables 1 and 2 revealed that quality of most of the commercial samples was very poor and it was reflected in higher TVN values and bacterial counts. However for a few smaller varieties of dried fish, the moisture and TVN values were quite low, although these were also

Table 1. *Chemical, bacteriological and organoleptic characteristics of commercial dried, tunnel dried and laboratory dried fish*

Samples	No. of samples analysed	Moisture %	TVN mg/100g (dry basis)	NaCl %	Total ash %	Acid insoluble ash, %	Total plate count per g	Count in salt medium per g	Score
1	2	3	4	5	6	7	8	9	10
Commercial									
Ribbon fish	12	45.2 (36.1–52.0)	357.7 (283.1–382.2)	11.3 (10.1–11.8)	16.2 (13.3–17.9)	2.8 (2.5–2.9)	4.2×10^3 ($1.8–5.6\times10^4$)	4.1×10^3 ($1.3–5.3\times10^3$)	0
Seer	6	46.3 (34.2–56.9)	284.0 (209.3–324.3)	11.5 (9.2–12.7)	22.3 (10.5–26.2)	5.1 (4.9–5.3)	2.3×10^4 ($1.1–3.1\times10^4$)	9.5×10^3 (6.2×10^3–1.2x10)	0
Sciaenids	15	43.3 (32.1–48.3)	215.2 (169.2–233.5)	11.2 (9.1–12.2)	17.1 (15.2–19.3)	4.3 (4.1–4.5)	5.4×10^4 ($2.3–6.7\times10^4$)	2.0×10^4 ($1.1–3.1\times10^4$)	1
Pomfret	6	47.5 (33.1–54 3)	426.7 (369 3–446.5)	9.1 (7.9–9.7)	19.5 (17.2–22.1)	5.93 (5.7–6.2)	1.5×10^5 (9.5×10^4–2.1×10^5)	9.2×10^3 (3.9×10^3–1.5×10^4)	0
Mullet	6	37.4 (29.1–44.2)	139.8 (89.7–152.1)	11.6 (9.9–11.9)	18.3 (16.2–20.5)	2.35 (2.0–2.6)	1.1×10^5 (9.1×10^4)–2.1×10^5	4.2×10^4 ($1.9–5.3\times10^4$)	3
Mackerel	6	41.5 (31.5–50.8)	317.8 (262.5–335.2)	18.1 (16.2–19.3)	22.1 (20.1–24.6)	7.2 (7.0–7.5)	1.5×10^5 (9.5×10^4–2.5×10^5)	2.0×10^4 ($1.1–2.9\times10^4$)	0
Shark	6	45.2 (4.25–50.3)	272.8 (238.3–289.2)	12.6 (10.7–13.2)	18.2 (16.1–21.7)	4.5 (4.35–4.8)	7.1×10^4 ($2.3–8.5\times10^4$)	5.1×10^2 ($1.8–6.5\times10^2$)	0
Engrandis	8	39.2 (35.0–42.1)	131.0 (111.3–142.5)	13.5 (10.8–14.1)	17.2 (14.9–19.3)	2.6 (2.35–2.9)	1.8×10^4 ($1.2–2.1\times10^4$)	6.2×10^3 ($3.9–7.5\times10^3$)	2
Cat fish	4	24.2 (20.2–27.5)	160.2 (132.1–172.7)	10.6 (9.1–11.2)	11.6 (9.7–13.9)	2.35 (2.2–2.5)	2×10^4 ($1.2–2.3\times10^4$)	5.0×10^2 ($1.3–6.9\times10^2$)	2
Sole	5	27.3 (24.7–29.2)	167.4 (132.8–178.2)	10.3 (8.9–11.1)	13.9 (11.2–17.3)	2.9 (2.75–3.05)	1.6×10^3 ($1.1–1.9\times10^3$)	7.2×10^2 ($3.1–8.9\times10^2$)	2
Lactarius	5	41.7 (39.2–43.2)	264.7 (239.8–278.2)	9.6 (8.2–10.1)	12.5 (10.3–13.7)	2.7 (2.53–28.5)	7.8×10^3 ($3.7–9.1\times10^3$)	2.0×10^3 ($1.1–3.3\times10^3$)	1
Miscellaneous	16	47.6 (41.5–49.7)	302.5 (276.6–321.7)	12.5 (10.1–13.2)	13.7 (11.3–16.1)	5.7 (5.5–5.9)	2.6×10^4 ($1.1–3.2\times10^4$)	7.1×10^3 ($2.7–9.5\times10^3$)	1
Anchovy	15	13.5 (11.5–17.8)	144.9 (113.2–162.8)	1.6 (1.5–1.7)	17.3 (15.9–19.3)	4.5 (4.3–4.6)	3.0×10^4 ($1.5–3.3\times10^4$)	N.D.	3
Silverbellies	4	14.5 (13.1–16.2)	114.7 (95.2–129.2)	1.7 (1.6–1.8)	12.2 (10.9–13.2)	2.1 (2.0–3.2)	1.7×10^3 ($1.1–1.9\times10^3$)	N.D.	4
Small shrimp	10	19.2 (13.2–23.1)	105.8 (84.3–125.7)	1.5 (1.4–1.6)	15.6 (14.2–16.7)	4.2 (4.1–4.3)	1.1×10^4 (9.8×10^3–1.7×10^4)	N.D	2

Table 1 (Contd.)

1	2	3	4	5	6	7	8	9	10
Tunnel dried									
Ribbon fish	2	18.2 (17.1–18.9)	57.7 (46.5–67.1)	20.2 (19.5–20.9)	29.5 (29.1–29.9)	1.2 (1.15–1.25)	$4x10^3$ ($1.2–6.8x10^3$)	$1.6x10^3$ ($1.4–1.8x10^3$)	5
Pink perch	4	22.6 (21.1–27.7)	63.7 (57.3–67.1)	18.7 (17.9–19.2)	28.7 (27.1–29.3)	1.1 (1.0–1.2)	$4x10^3$ ($1.3–6.2x10^3$)	$9.0x10^2$ ($3.5–9.5x10^2$)	5
Sciaenids	4	25.8 (24.1–29.7)	71.0 (67.2–75.9)	17.2 (16.9–17.8)	28.6 (27.2–29.1)	0.9 (0.85–0.95)	$6x10^3$ ($2.5–7.3x10^3$)	$2.0x10^2$ ($1.2–3.1x10^2$)	5
Shark	2	25.3 (23.1–28.5)	76.4 (71.2–82.9)	18.2 (17.8–18.6)	28.7 (28.5–28.9)	1.1 (1.0–1.2)	$1.9x10^3$ ($1.2–2.6x10^3$)	$7.0x10^2$ ($5.4–8.6x10^2$)	5
Saurida	2	26.7 (25.7–28.3)	58.0 (51.9–62.2)	17.5 (17.2–17.8)	29.2 (28.9–29.5)	0.72 (0.70–0.74)	$1.5x10^3$ ($1.1x1.9x10^3$)	$1.5x10^2$ ($2.2–3.8x10^2$)	5
Laboratory dried									
Sciaenids	4	30.5 (27.1–33.5)	85.6 (81.2–90.2)	17.2 (16.9–17.5)	26.2 (25.8–26.5)	1.2 (1.1–1.3)	$7x10^3$ ($2.5–8.9x10^3$)	$1.2x10^3$ ($1.1–1.3x10^3$)	5
Ribbon fish	5	27.2 (24.5–29.3)	85.9 (80.5–89.2)	18.3 (17.8–18.5)	32.3 (32.0–32.9)	1.4 (1.2–1.5)	$1.2x10^4$ ($1.1–1.3x10^4$)	$3.2x10^3$ ($2.7–3.8x10^3$)	4
Mackerel	4	27.2 (25.1–29.7)	95.1 (89.7- 97.2)	20.3 (19.8- 20.5)	24.5 (24.0–24.9)	1.7 (1.6–1.8)	$1.3x10^4$ ($1.0–1.6x10^4$)	$2.8x10^3$ ($2.1–3.2x10^3$)	4
Cat fish	3	28.9 (27.7–30.8)	91.8 (89.1–93.7)	18.2 (17.8–18.3)	25.7 (25.3–26.1)	1.6 (1.5–1.7)	8.2×10^3 ($3.8–9.3x10^3$)	$2.1x10^3$ ($1.9–2.3x10^3$)	4

Organoleptic score: Poor = O, Poor to fair = 1, Fair = 2, Fair to good = 3, Good = 4, Very good = 5

Table 2. *Range of moisture, salt and acid insoluble ash of the commercial dried, tunnel dried and laboratory dried samples with corresponding average values*

Sample		Moisture %			Salt %				Acid insoluble ash%		
		Below 35	Between 35–40	Above 40	Below 10	Between 10–15	Between 15–20	Above 20	Below 1.5	Between 1–5–5.0	Above 5.0
Commercial dried fish (cured)	Percentage of samples in the range	30.21	10.30	50.51	46.75	20.77	32.46	—	—	69.74	30.21
	Average	29.72	37.27	44.89	8.27	12.92	17.87	—	—	2.90	8.70
Tunnel dried fish	Percentage of samples in the range	100.00	—	—	—	—	85.7	14.3	100	—	—
	Average	24.27	—	—	—	—	18.68	20.52	1.12	—	—
Laboratory dried fish	Percentage of samples in the range	100.00	—	—	—	—	81.70	18.30	82.30	17.70	—
	Average	28.38	—	—	—	—	18.92	20.61	1.42	1.61	—

heavily contaminated with sand. About 80 per cent of the market samples showed the presence of coliform organisms ranging from 20 to 80 per g, whereas laboratory samples and tunnel dried samples were free from coliform organisms. None of the samples revealed the presence of bacteria of public health significance like *E. coli*, faecal streptococci and coagulase positive staphylococci. All the tunnel dried and laboratory made samples were rated good while only 11% of the commercial samples were rated fair to good or above. The factors such as quality of raw material, poor handling and preprocessing, repeated use of same brine, insufficient salt, unhygienic drying condition and insufficient drying might be the reasons for poor quality of commercial samples. The quality of fish can be considerably improved by adopting proper processing techniques and hygienic drying conditions.

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