Fishery Technology 49 (2012) : 167 - 171

Quality Aspects of Dried Fish Marketed in the North Eastern States of India

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Abstract

Physical, sensory, biochemical and microbiological quality of dry fish products (nine unsalted and six salted) available in Jagi Road dry fish market of Assam was evaluated. Moisture content varied from 11.08 to 44.32% and salt content from 0.26 to 3.4% in unsalted and from 15.71 to 52.76% in salted samples. Ash content varied from 9.28 to 28.72% in different samples. The TVBN value was in the range of 205 to 427 mg% in eight samples while in seven samples, it was from 49 to 186 mg%. *Escherichia coli* was absent in all the samples, while coagulase positive staphylococci was present in one sample and faecal streptococci in two samples. Fungi was present in all the samples except one. The study showed that 80% of the products traded were of poor quality.

Keywords: Dried fish, NEH State, sensory quality, microbiological quality, India

Received 30 September 2011; Revised 09 November 2011; Accepted 25 November 2011

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Introduction

Acute shortage of fresh fish gives way for the wide acceptance of dry fish in North Eastern Hill (NEH) states of India. Consumers of dry fish include poor tribal labourers and weaker sections of the society working in plantations, estates and coal mines. Their socio-economic and educational background compels them to go for low cost food rather than high cost quality products. Dry fish for distribution in this region comes from distant centres of production in the coastal states as well as from interior fishing villages of the country. Jagi Road dry fish market in Assam, situated at about 50 km north of Guwahati and one of the largest dry fish markets in South East Asia plays a key role in the distribution of dry fish in this region. Dry fish from all maritime states of India is brought to Jagi Road market either by trucks or train. Transportation from far away places such as Tamil Nadu and Karnataka often takes 6 to 8 days or even more to reach the destination. Since the demand for dry fish is very high in the NEH states, there is good supply of this commodity from various sources spread over the country (Anon, 2004). Quality of dry fish coming to this market is generally very poor. Since the dry fish is going to a large area extending across seven states in the NEH region, a study on the quality of dry fish distributed from this market is of paramount importance.

Several studies have been conducted on fish drying practices followed in different regions of India and the quality of dried fish reaching to the domestic market (Lahiry et al., 1961; Valsan, 1985; Kalaimani et al., 1984). The effectiveness of calcium propionate against fungal attack, red halophiles and rancidity was reported by Valsan (1985). Smoke curing has also been subjected to detailed study and process for smoke curing of several tropical fishes such as eel, mackerel, tuna, sole, shark, oil sardine, cat fish and mussels have been reported (Solanki et al., 1970; Devadasan et al., 1975; Muraleedharan & Valsan 1976, 1980; Muraleedharan et al., 1979). Joseph & Gopakumar (1997) conducted a detailed study on the quality of dried fish traded in Kerala and Tamil Nadu and observed that only 17 % was fit for human consumption. However, reports on the quality of dry fish landed in NEH states are very limited except a study by Karthikeyan et.al. (2007). In this background, this study on the quality of dried fish from Jagi Road dry fish market in Assam, was attempted.

Materials and Methods

Fifteen samples of major dry fish varieties sold in Jagi Road dry fish market in Assam were collected and brought to the laboratory for physical, sensory, biochemical and bacteriological quality evaluation. The samples were examined for physical features such as appearance, colour, odour, smell, texture, presence of insects and fungal growth. As few samples had off-odour, the dry fish samples were cooked in boiling water for evaluating the odour and flavour as suggested by Connell (1995). The dressed dry fish sample (15 g) was taken in an aluminium foil pouch and boiled for 15 min in boiling water and sensory qualities like odour and flavour of the samples were evaluated using a 5 point Hedonic scale (Maynard et al., 1965) by a trained taste panel. Moisture, salt, ash and acid insoluble ash were determined as per AOAC (2000). Total volatile basic nitrogen was estimated by Convey method (1947). The total viable bacterial count (TPC) was determined using Tryptone Glu-

Table 1. Physical and sensory characteristics of dry fish from Jagi Road market

Dry fish/Product	Physical characteristics	Sensory characteristics on cooking	Quality rating
Keski	Small anchovy like fresh water fish. Unsalted & dried	Foul & rusty smell. Cooked samples gave burnt odour	Poor
Shidal	Fermented fish product prepared from putti (Punctius spp)	Fermented and rancid odour	Poor
Telas kandi (*Engraulis* spp)	Dried with no salt, brownish and sticky. Foul/ rancid and ammoniacal smell	Rancid, burnt and foul smell	Poor
Busi (mixture of small fresh water fish)	Dried whole without salting, dull colour rancid odour and foul smell	Burnt and foul smell	Poor
Cat fish (*Arius* spp)	Unsalted and dried whole, unhygienic appearance	Burnt, unpleasant and ammonia smell	Poor
Shrimp	Dried whole, unsalted, poor appearance	Foul and burnt smell	Poor
Tapra (Herring)	Small herring like fish. Dried unsalted, brownish and sticky. Slight rancid odour	Slight rancid smell	Fair
Methili	Unsalted and dried fresh water fish	Burnt and unpleasant smell	Poor
Bomla (Bombay duck)	Dried unsalted, appearance satisfactory	Foul smell	Poor
Choori (Ribbon fish)	Salted and dried as whole, appearance satisfactory	Unpleasant smell	Poor
Choori (Ribbon fish)	Split open, salted and dried, appearance satisfactory	Slight fermented odour	Good
Mackerel	Salted and dried whole, poor appearance	Foul and rancid smell	Poor
Hilsa	Salted and dried whole, good appearance	No foul smell, characteristic salt cured odour, slight rancid odour.	Fair
Dhoma (Croaker)	Salted and dried jew fish. Cut along the top of belly portion up to gill cover. Gut contents intact, unhygienicappearance.	Slight fermented and rancid odour	Fair
Cat fish (Thenghara)	Salted and dried, split open, appearance satisfactory	Slight fermented odour	Good

[Quality rating: Excellent -5; Very good -4; Good -3; Fair -2; Poor -1]

cose Agar (TGA), *Escherichia coli* using Tergitol 7 agar, faecal streptococci using KF agar and coagulase positive staphylococci using Baird – Parker agar (FDA, 1973; Difco 1971). Fungi were detected using Dichloran Rose Bengal-chloramphenicol Agar (DRBC) medium as per Hocking & Pitt (1980).

Results and Discussion

Among the 15 dry fish samples, nine were unsalted while six were salted. Physical and organoleptic characteristics of the dry fish samples are presented in Table 1. Based on the physical and organoleptic evaluation, 66.7% of fish samples were rated poor in quality and found unfit for human consumption. Three samples *viz*., *tapra*, hilsa and *dhoma* were just acceptable while two samples, *choori* and *thenghara* were of good quality. The samples in general had foul smell and unhygienic appearance.

Moisture, ash, acid insoluble ash, total volatile base nitrogen (TVBN) and salt content in the dry fish samples are given in Table 2. The moisture content was above the recommended level in eight samples viz., *keski*, *busi*, shrimp, *tapra*, *methili*, *bomla*, mackerel and cat fish. The moisture content was within 30% in 13 samples, which is the recommended content for most of the fish species (BIS, 2001) The salt content in three samples, *viz*., two samples of *choori* and one sample of mackerel was 16.20, 15.71 and 21.32% respectively which were below the recommended level of 25 – 30% on dry weight basis as per IS 14950: 2001. The TVBN values were high in mackerel and *choori* while it was low in split open *choori*. The salt content was 28.55, 30.86 and 52.76% in hilsa, *dhoma* and cat fish and the TVBN values were 56.0, 84.0 and 49.0 mg% respectively. Among the nine unsalted dry fish samples, six samples had very high values of TVBN ranging from 205.0 to 420.0 mg%. Moisture content in *tapra*/herring was 18.18% and TVBN value 119.0 mg% which were within the acceptable limit while the salt content was very low (2.86%). The TVBN value, an indicator of spoilage was 205.0 to 427.0 mg%, in eight samples and in seven samples it was in the range of 49.0-186.0 mg%. The ash content ranged from 9.28-28.72% and the acid insoluble ash ranged from 0.18 - 4.22%. High levels of ash content and acid insoluble ash indicate the presence of sand due to unhygienic handling.

Microbiological quality of the dry fish samples is presented in Table 3. Total plate count (TPC) ranged from $5.8x10^4$ to $6.0x10^9$ cfu g^{-1} and it was above the acceptable limit as per BIS:2001 in 11 samples out

Table 2. Biochemical parameters of dry fish from Jagi Road dry fish market

Fish (Local name)	Moisture (%)	Salt (%)	TVBN (mg %)	Ash (%)	Acid insoluble ash (%)
Keski (White Bait)	18.97	0.287	205.0	11.32	0.854
Shidal	30.898	1.700	420.0	14.26	0.188
Telas kandi	11.08	0.262	259.0	9.28	0.191
Busi	23.85	0.460	406.0	16.10	4.224
Thenghara	13.61	1.082	175.0	28.72	1.884
Shrimp	15.73	1.186	186.0	9.67	1.860
Tapra/Herring	18.18	2.86	119.0	26.76	0.824
Methili	19.92	5.40	245.0	18.75	2.442
Bomla (Bombay Duck)	23.53	8.40	364.0	10.27	0.218
Choori- 1	23.69	16.20	207.2	18.91	0.348
Choori- 2	12.99	15.71	84.0	26.19	0.274
Mackerel	44.32	21.32	427.0	18.30	0.884
Hilsa	22.23	28.55	56.0	25.47	-
Dhoma	22.37	30.86	84.0	26.02	0.864
Cat fish	49.58	52.76	49.0	23.24	1.772

Table 3. Microbial quality of dry fish samples traded in the NEH States

Fish	TPC g (cfu $g^{-1)}$	E. coli (g^{-1})	Coagulase + ve Staphylococci (g^{-1})	Faecal Streptococci (g^{-1})	Fungi
Keski	$1.51x10^6$	NiI	Nil	Nil	Present
Shidal	$7.0x10^8$	NiI	Nil	Nil	Present
Telas Kandi	$1.82x10^8$	Nil	NI	$1.43x10^4$	Present
Busi (mixture of small fish)	$5.7x10^8$	Nil	Nil	Nil	Present
Cat fish (thenghara)	$9.3x10^5$	Nil	$6.0x10^2$	NI	Present
Shrimp	$2.3x10^6$	Nil	Nil	Nil	Present
Tapra/Herring	$5.8x10^4$	Nil	Nil	Nil	Present
Methili/fresh water fish	$1.88x10^6$	NiI	Nil	$3.9x10^4$	Present
Bombay duck	$4.5x10^5$	Nil	NI	Nil	Present
Ribbon fish	$6.0x10^9$	Nil	Nil	Nil	Present
Choori (ribbon fish)	$9.5x10^4$	Nil	Nil	Nil	Present
Mackerel	$1.4x10^8$	Nil	Nil	Nil	Nil
Hilsa	$8.5x10^5$	Nil	Nil	Nil	Present
Dhoma	$6.5x10^4$	Nil	Nil	Nil	Present
Cat fish	$6.5x10^4$	Nil	Nil	Nil	Present

of 15. In one sample, *thenghara* (cat fish), presence of coagulase positive staphylococci was above the acceptable level ($6.0x10^2$ g^{-1}). Faecal streptococci were detected in high levels in *telas kandi* (1.43 x 10^4g^{-1}) and *methili* (3.9 x 10^4g^{-1}). Fungi were present in all the samples except mackerel, where salt content was high at 21.32%. *Escherichia coli* was absent in all the samples. The limit for TPC in dry fish is 100000 g^{-1} and coagulase positive staphylococci is 100 g^{-1} as per IS 4950 : 2001. Based on bacterial quality, 12 samples out of 15 (80%) were found unacceptable for human consumption. The study by Karthikeyan et al. (2007) showed that freshwater fish dried to a moisture content of 6.8 to 19.9% had microbiological and sensory factors within acceptable limit.

The general observations by many workers on dry fish quality were also similar to the present studies. Study on quality of cured fish traded in markets in Kerala and Tamil Nadu by Joseph & Gopakumar (1997) showed that only 17 % of the dry fish was fit for human consumption. The major reason for the high level of quality degradation in dry fish is the time delay in processing. Fish is usually landed in the evening and only good quality fish is taken care of while bulk of the landing, constituted by the low value fishes is left on the shore for curing on the next day (Joseph et al., 1992). The study by Kalaimani et al. (1988) showed that samples were found infested with beetle after three weeks of storage. Delayed processing and unscientific post harvest handling lead to poor quality products resulting in nutritional loss for the consumer and financial loss to the processors (Poulter et al., 1988).

The study showed that 80% of the dry fish collected from Jagi Road dry fish market was of poor quality with respect to physical, organoleptic, microbiological and other spoilage indicators and was found unacceptable for consumption. Practice of curing without salting is a major cause for quality deterioration in dried fish. There is no dearth of improved technology for this sector but the primary processors as well as the consumers have to be made aware of the quality issues in dry fish and the implications of poor quality.

Acknowledgement

The authors thank the Director, Central Institute of Fisheries Technology, Cochin for permission to publish this paper. The technical assistance rendered by Smt. K.B. Beena and Smt. K.P. Leelamma of the Fish Processing Division and Shri. N.M. Vasu of Microbiology, Fermentation and Biotechnology Division is gratefully acknowledged.

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