



## SOME ASPECTS OF BIOCHEMICAL AND MICROBIAL ANALYSIS OF SUN DRY FISH *TRICHIURUS LEPTURUS* LINNAEUS, 1758 FROM THE EAST COAST OFF VISAKHAPATNAM

<sup>a</sup>Geetha, S., <sup>b</sup>Govinda Rao, V., <sup>b</sup>Muddula Krishna, N., <sup>b</sup>Ram Sai Reddy, N. & <sup>b</sup>Ramesh Babu, K.

<sup>a</sup>P.G. Dept of Microbiology Visakha Govt. UG & P G College for Women, Visakhapatnam, Andhra Pradesh, India

<sup>b</sup>Department of Marine Living Resources, Andhra University, Visakhapatnam, Andhra Pradesh, India

### ABSTRACT

Sundry fish *Trichiurids* are unhygienically sun dried by keeping on the seashore, on mats or road sides. In our present study the biochemical and microbial qualities of fresh and sun dried were assessed. The samples were bought from the coastal villages and local market at East coast of Visakhapatnam, India. The biochemical composition such as moisture, ash, protein, carbohydrates and lipid content and occurrence of bacteria and fungi isolates were estimated by standard methods. The biochemical component of the dried fish sample serve as a good source of protein. The bacterial counts ranged from  $1.1 \times 10^4$  to  $2.5 \times 10^5$  cfu/g while the fungal counts ranged from  $2.0 \times 10^5$  to  $5.0 \times 10^6$  cfu/g. It showed that of bacterial isolated from the dried fish, *Staphylococcus* was the most predominant organism. The finding of this study showed that microbial load in the samples from villages was high due to clean and safe practices were not strictly followed.

**KEY WORDS:** biochemical composition, microbial quality, dried fish

### INTRODUCTION

Fish plays an important role in the diet of human beings since it is a good source of protein. About 80% of the animal protein in our diet comes from fish alone (Rubbi *et al.*, 1978). Generally Ribbon fishes are very common in the East Coast of India. A large quantity of *Trichiurids* normally spoil within 12 to 20hrs depending on the species and the capturing methods. Sun drying of fishes is a traditional practice followed in many parts of the world (Sachithanathan *et al.*, 1985). Drying is the most convenient and cheapest method for preservation of fishes (Eyo, 1985). Major problems with traditional sun drying are loss of quality due to contamination and infestation. A number of *Trichiurids*, in small numbers are landed by a bottom trawl catches at the fishing harbour. Among the traditional gear boat seine, shore seine and gill net are common nets being operated along this coast. *Trichiurus lepturus* with the length range of 38cm and weighing 30 gram are fished throughout the year and consumption as fresh and dried forms. These fishes are characterized as short lived, fast growing fishes with relatively high rates of natural mortality. During summer months (April to June), the temperature ranges from 30 to 40°C and relative humidity ranges between 56 – 100%.

During these months, most of the fishes are salted and naturally sun dried in coastal villages by keeping on palm leaves on the ground or on the sea shore essentially sold in the local markets. The present investigation has been carried out to determine the microbial and biochemical qualities on fresh and dried fish food of *Trichiurus lepturus*, from the coast of Vishakhapatnam.

### MATERIALS & METHODS

#### Study area

In Visakhapatnam, is located in Middle East coast of India. The variety of gears were used at the local fishing harbour and nearby fishing villages. These fishes have been the base for a variety of fishing activities for a long time.

#### Sample collection

Fresh and naturally sun dried samples were collected from local fish market and fishing harbour, during the period of March 2013 to April 2014. The lists of sample collected sites are represented in Table 1. Sun drying of fishes normally practiced only in the Visakhapatnam and nearby coastal village. Hence, hygienically sun dried samples were collected only from coastal village, markets and they were brought to the laboratory for further analysis. The fresh and sundried samples were represented in Figure 1.

**TABLE 1:** List of Sampling Points

Sl. No.	Name of Collection sites
1	Harbour (fresh)
2	Harbour (dry)
3	Village 1(Bhemilli)
4	Village 2 (Sagar Nagar )
5	Market 1 (Purna market)
6	Market 2 (Allipuram Market)



FIGURE 1: Fresh and dried *Trichiurus lepturus*

**Biochemical and microbial analysis**

The samples were ground and powdered for the analysis of moisture, protein, lipids, Ash analysis and microbial parameters such as total plate count (TPC), total fungal count (TFC), *Salmonella*, *Vibrio* and *E. coli* analysis. The moisture content of all the samples was analyzed by drying the samples in a hot air oven. The protein content of the samples was estimated by Lowry’s method (Lowry *et al.*, 1951) and lipid by using gravimetric method (Folch *et al.*, 1957), the ash content was measured by the method of Clucas and Ward (1996) using Muffle furnace. The microbiological characteristics such as total plate count (TPC) were enumerated by using plate count agar and total fungal count (TFC) was enumerated using potato dextrose agar (APHA 1992). The pathogenic bacteria like

*Escherichia coli*, *Salmonella* and *Vibrio* were enumerated by the method (USFDA 1995).

**RESULTS & DISCUSSION**

In this study organoleptic characteristics of fresh and dried fish products observations were presented in the Table 2. Organoleptic characteristics of the dried fish products produced from salted sun dried were used in the Visakhapatnam. The colour of fresh fish *Trichiurus lepturus* fish was whitish and with little difference among fish species. The whitish shiny (Fresh) to brownish (Dry) in colour and firm and flexible in texture in *T. lepturus*. There were no insects, infestation, or broken pieces were found around the products.

TABLE 2: Organoleptic characteristics fish products

Collection Sources	Colour	Use of Chemicals	Odour	Texture	Infestation	Broken pieces	Overall quality
Harbour (Fresh)	Whitish Shiny	No	Characteristic odour	Firm and flexible	No	No	Good
Harbour (Dry)	brownish	No	Characteristic odour	Firm and flexible	No	No	Good
Village 1 (Dry)	brownish	No	Characteristic odour	Firm and flexible	No	No	Good
Village 2 (Dry)	brownish	No	Characteristic odour	Firm and flexible	No	No	Good
Market (Dry)1	brownish	No	Characteristic odour	Firm and flexible	No	No	Good
Market (Dry) 2	brownish	No	Characteristic odour	Firm and flexible	No	No	Good

Proximate composition of *T. lepturus* product was reported in Table 3. The moisture content seems to be an exact indicator of susceptibility of a product to undergo

microbial spoilage. It has been reported that moisture contains more in fresh fish to compare with well dried samples.

TABLE 3: Proximate composition of fish products

Collection Sources	Moisture%	Water activity%	Protein%	Lipid %	Ash %	Carbohydrate %
Harbour (Fresh)	56	0.92	12.3	14	0.82	5%
Harbour (Dry)	6.2	0.7	93.5	0.62	6.1	0
Village1 (Dry)	8.3	0.5	95.5	0.5	6	0
Village 2 (Dry)	4	0.69	96	0.65	5.6	0
Market (Dry)1	11.2	0.72	71.5	0.42	2.7	10
Market (Dry) 2	5	0.5	95	0.65	6.5	0

The natural sun drying usually takes three days for proper drying of fish. The results of biochemical composition are presented in Figure 2. Fresh sample had a moisture level of 56%, whereas the samples of naturally sun dried had 6.2%, 8.3%, 4%, 11.2% and 5% moisture levels

respectively. The moisture content seems to be an exact indicator of the susceptibility of a product to undergo microbial spoilage. It has been stated that well dried or moisture content reduced to 25% will not be affected by microbes and if further dried to 15%, the growth of mould

will cease and thereby it increases the shelf life (Glucas, 1982). The crude proteins content in fresh sample was 12.3% and it was increased in dried samples. Increase of protein was due to dehydration of water molecule between the proteins causing aggregation of protein and thus results in the increase in protein content of dried fishes (Ninawe and Rathanakumar, 2008).

The lipid content in fresh sample was 14% and varied in dried fish samples [0.65 to 0.4 %]. The lipid contents were lower in dried samples than the fresh fish; the variation could be the result of evaporation of moisture content with lipids. The fat content may be reduced with the evaporation of moisture content and increase during heat

treatment. In the fresh fish the ash content was very low in the sample. The ash content varied significantly between the samples and the value was 2.7 to 6.5% in dried samples. Clucas and Ward (1996) reported that inorganic contents remain as ash after the organic matter is removed by incineration. Natural sun drying was done in open space which allows settling of wind borne dust, insect and bird infestation. It would increase the inorganic contents in the samples and this may be the major reason for higher ash content in the dry samples. Fresh sample had a carbohydrate level of 5%, whereas the samples of naturally sun dried market 1 contain 10% of carbohydrate level.

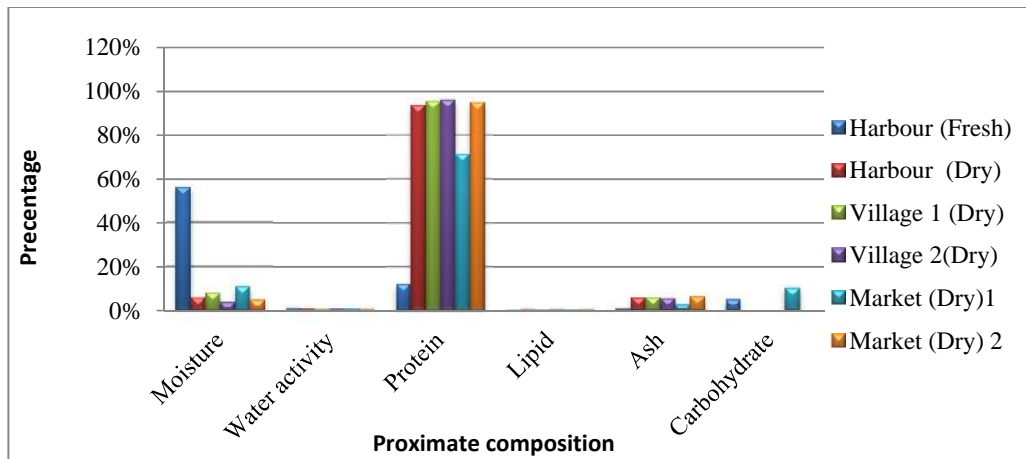


FIGURE 2. Biochemical composition of fresh and dried fish

**Microbial quality**

Microbiological analysis also showed variations among the samples. The Total Bacterial Count [TBC], Total Fungal Count and pathogenic *E. coli*, *Salmonella*, *Vibrio*

and *Staphylococcus* were assessed. The results were presented in table 4 and 5. The result of microbial analysis revealed that the TPC were high in sun dried samples.

TABLE 4: Total Bacterial and Fungal Isolates

Collection Sources	TBC (cfu/g)	TFC (cfu/g)
Harbour (Fresh)	2.5 X 10 <sup>5</sup>	5.0X 10 <sup>6</sup>
Harbour (Dry)	1.2 X 10 <sup>5</sup>	2.5X 10 <sup>6</sup>
Village 1 (Dry)	1.1X 10 <sup>4</sup>	2.0X 10 <sup>5</sup>
Village 2(Dry)	1.1X 10 <sup>4</sup>	2.2X 10 <sup>5</sup>
Market (Dry)1	1.5X 10 <sup>4</sup>	3.2X 10 <sup>5</sup>
Market (Dry) 2	2.2X 10 <sup>5</sup>	4.4X 10 <sup>6</sup>

TABLE 5: Occurrence of Bacterial and Fungal Isolates

Collection Sources	<i>E.coli</i>	<i>Salmonella</i>	<i>Vibrio</i>	<i>Staphylococcus</i>	<i>Aspergillus</i>	<i>Mucour</i>	<i>Penicillium</i>
Harbour (Fresh)	+	+	+	+	+	+	+
Harbour (Dry)	-	-	-	+	+	+	+
Village 1 (Dry)	-	-	-	+	+	+	+
Village 2(Dry)	-	-	-	+	+	+	+
Market (Dry)1	+	-	-	+	+	+	+
Market (Dry) 2	+	+	-	+	+	+	+

(+: Present; -: Absent)

In the case of pathogens, *E. coli* is present only in market sample, where as *Salmonella* and *Vibrio* pathogens were absent in all samples. Immaculate *et al.* (2012) studied the microbial quality of commercially available dried fishes of Indian and reported the presence of microbes. The presence of *Aspergillus* reported in this study revealed about the toxin produced by this fungal isolate. This could become the possible source *Aspergillosis* transmission

among consumer. *Aspergillus* and related molds generally grow faster and are more resistant to high temperature and low water activity than *Penicillium* and tend to dominate spoilage in warmer climates (Doyle, 2007). In our present investigations microbial load in the samples from villages was high due to clean and safe practices that were not followed properly.

## CONCLUSION

The biochemical composition the dry fish reveals that the fish sample serve as a good source of protein. However, the presence of some pathogenic bacterial isolates such as *E. coli* reveals the pollution of the aquatic habitats with faecal matter either from sewage disposal or from human activities. This study revealed that the fish samples from market have high microbial loads of pathogenic microorganisms. However, there should be proper processing, storage and handling measures. People should be oriented not to buy fishes that have shown signs of spoilage.

## REFERENCES

- APHA (1992) Compendium of methods for the microbiological Examination of foods 3<sup>rd</sup> ed., C. Vander dent, and splittstoesser, D, (Eds), APHA, Washington Dc 2:1264pp.
- Clucas, I.J. and Ward, A.R. (1996) Post Harvest Fisheries Development; A Guide to handling, preservation, processing and quality. Natural Resources institute. U.K 5:428.
- Doyle, E. M. (2007) FRI BRIEFINGS: Microbial Food Spoilage: Losses and Control Strategies. *A Brief Review of the Literature*. Food Research Institute, University of Wisconsin – Madison [Http:// fri.wisc.edu/docs/pdf/FRI-Brief- Microbial-Food Spoilage](http://fri.wisc.edu/docs/pdf/FRI-Brief-Microbial-Food-Spoilage) 707.
- Eyo, A. A. (1986) Significance of fish handling preservation and processing in the development of Nigeria inland fisheries with special reference to Kanji Lake. Fisheries society Nigeria: Nigeria: 3<sup>rd</sup> annual conference proceedings.
- Folch, J., Lees, M. and Bloune, S.G.H. (1957) A simple method for their isolation and purification of total lipids from animal tissues. *Biological chemistry* 266, 497-509.
- Glucas, I. J. (1982) Present fish drying techniques in Zambia and suggested improvements. A report prepared for fisheries development project. Rome. FAO F. J. Zam (73/00/3FAO):25 P.
- Immaculate, J., Sinduja, P. and Jamila, P. (2012) Biochemical and microbial qualities of *Sardinella fimbriata* sun dried in different methods. *International Food Research Journal* 19(4): 1699-1703
- Lowry, O., Rose, B.H., Fart, N. J. and Randall, R.J. (1951) Protein measurement with the Folin phenol reagent. *Journal of Biological chemistry* 193, 265-275.
- Ninawe, A.S. and Rathnakumar, K. (2008) Fish processing technology and Product development, Impact of curing pp 5: 142 (1<sup>st</sup> edition).
- Rubbi, S.M., Muslemuddin, M. and Wahed, A. (1978) The present status of fish technology and inspection in Bangladesh. Paper presented to the FAO/Danida Workshop on fish technology, Columbia, Srilanka.
- Sachithanathan, K., Trim, D.M. and Spears, C. I. (1985) A solar- dome dryer for drying fish. Proceedings of the FAO expert consultants of fish technology, In Africa Lusaka Zambia 329, 161-172.
- USFDA (1995) Bacteriological analytical manual, 8<sup>th</sup> edition. AOAC International Gathers burg, USA 401: 614 pp.