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A STUDY ON NUTRIENT CONTENT OF FEW DRY FISH IN MANGALDOI, ASSAM

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Authors CK and DS designed the study. Author DB performed the experiments. Authors CK, MB and AD wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted on eight dry fish samples from Kaikara village, Mangaldoi District, Assam. The samples were analysed for moisture content, protein content, lipid content, pH, carbohydrate content and antioxidant activity. Analysis was carried out following standard methods. The study reported that all the fish samples were rich in carbohydrate, protein and lipid and highly nutritive for the native population.

Keywords: Dry fish; protein; lipid; moisture; antioxidant.

1. INTRODUCTION

The north-eastern region of India is a treasure of natural products. Using these natural products, the people of more than hundred tribes and communities developed their own and unique food products through the ages [1]. In Assam, because of presence of large number of water bodies, a large variety of fresh water fishes are available in abundance. Fishes are rich in nutrition [2]. People of Assam used to dry fishes in different manner and stored them for future use [3]. The method of drying has been being considered as one of the old preservation methods compared to newer techniques such as refrigeration and canning [4]. Fishes are prone to get spoiled or rotten, therefore, some methods are applied to stop the bacteria that produce spoilage. The shelf life of dried fishes ranges upto several years. Although drying is an age old method, but it is considered to be the best of all other preservation techniques. [5].

Mangaldai is a small town and head quarter of Darrang district in the Indian state of Assam. It was

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named after "mangaladahi" who was the daughter of the Rajah of Darranand married to the Ahom King Pratap Singha. The study was carried out in a village namely Kaikara, which is situated near deomornoi, a south-west place of Mangaldai. Its latitude is 26.11 and longitude is 91.83. In this village the fermentation process of fishes is somehow different to that of the other types like shidol and all. They use all types of small fishes found at the time of monsoon period in the fermentation process. The fermented fish of this place is known as "jakot diya maas" or "hukan maas". It is a tradition for the people of that area. During monsoon season, people catch the fishes together by nets or bamboo fishing implements and the small fishes are parted and cleaned. After washing thoroughly, these are placed on sieve or "saloni" to remove extra water. In the bamboo sieve "dhekiya" (*Diplazium esculentum*) or "noro-hingho" (*Murraya koenigii*) leaves are place and fishes are evenly spread over it. Then the selected fishes are kept above moderate fire for 3 to 4 hour. After that dried fishes are kept in bottles and stored for future use.

Nutritional composition vary in different dried fish. So it is necessary to ensure the nutritional value of the dried fish products and the present investigation was carried out in order to assess the percentage of nutrient composition of dry fishes through laboratory analysis.

2. MATERIALS AND METHODS

Eight different dry fish samples (Table1, Fig. 2) were collected from Kaikara village, Mangaldai. They were cleaned thoroughly and extra water was removed. On a bamboo sieve fiddlehead fern (*Matteuccia struthiopteris*) or curry leaves (*Murraya koenigii*) were spread and fishes were spread evenly over it and placed upon fire over a flat top of a bamboo stand (Fig. 1). Sites of the fishes were changed timely. After dried thoroughly kept in any air tight container and was used for the determination of proximate compositions.

3. NUTRITIVE COMPOSITION

Nutritive component such as moisture, protein, lipid, pHand carbohydrate are analysed using standard protocol [6,7,8,9].

Moisture content: To analyse moisture content, 1gm of dried fish sample was taken and kept at 105ºC in hot air oven until a constant weight is obtained. The difference in weight can be calculated & expressed as % moisture content of the sample. Percentage was calculated by the following formula:

Moisture % = (weight of tissue-dry weight of tissue) ×100/weight of tissue.

Protein content: Protein content was done as per Lowry's method (Lowry et al, 1951). To a 10 mg of sample 1ml of 1N NaOH was added for protein extraction in water bath for 30 minutes. Thereafter, it was cooled at room temperature and neutralized with 1N HCL. The sample was then centrifuged at 2000 rpm for 10

Fig. 1. Sample preparation

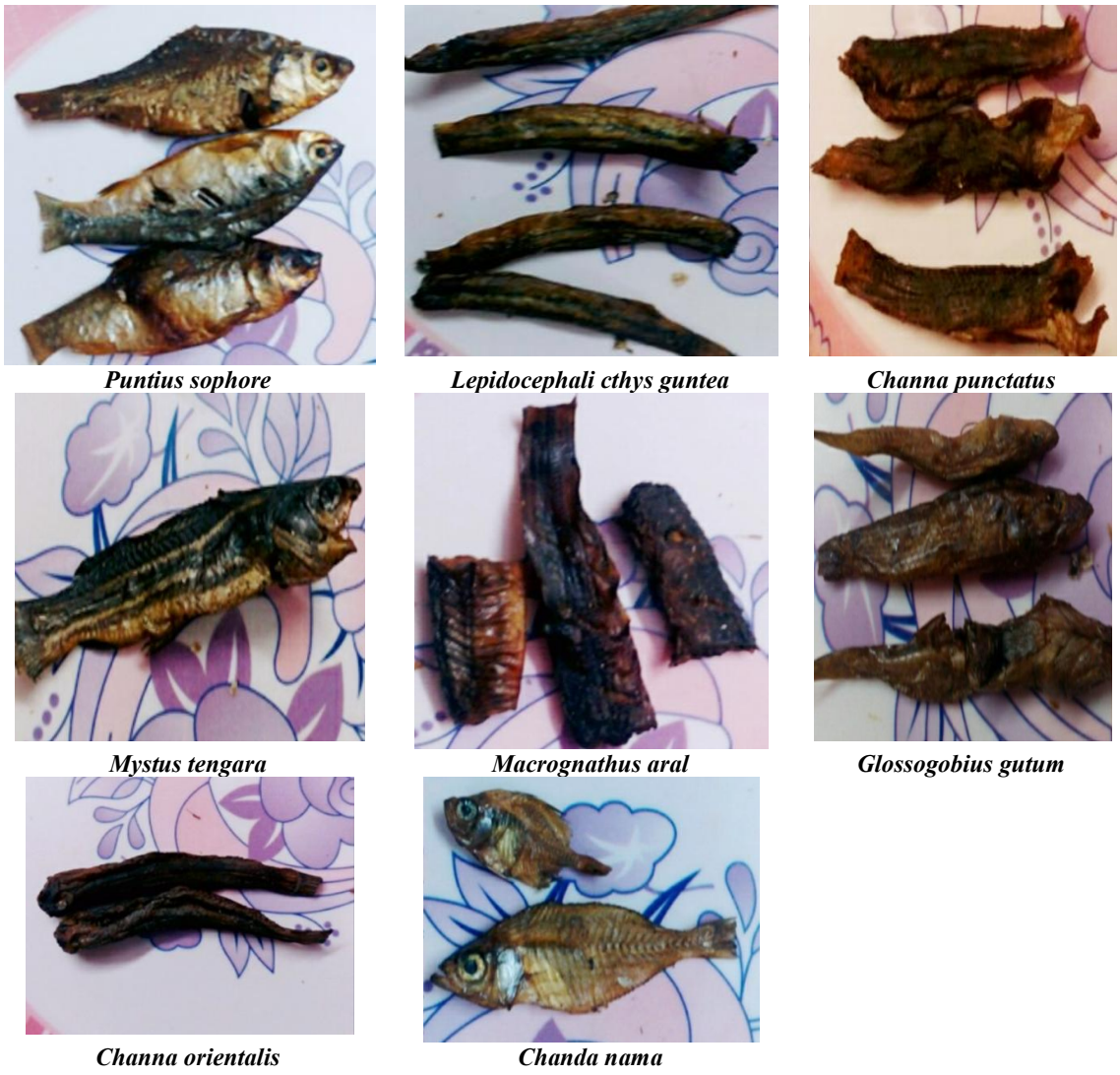


Fig. 2. Eight different types of sample

Table 1. Local name, English name and scientific name of the samples

Sample no.	Local name	English name	Scientific name
1	Puthi	Spot fin swarm barb	*Puntius sophore*
2	Botiya	Guntea loach	*Lepidocephali cthys guntea*
3	Goroi	Spotted snake head	*Channa punctatus*
4	Tingorah	Tengara mystus	*Mystus tengara*
5	Tora	One-striped spiny eel	*Macrognathus aral*
6	Padmutura	Bar-eyed-goby	*Glossogobius gutum*
7	Sengheli	Asiatic snake head	*Channa orientalis*
8	chanda	Elongate glassy perchlet	*Chanda nama*

minutes and an aliquot of the sample (1ml) was further diluted with distilled water (1/9 v/v).

Different aliquots of standard solution, 0.0, 0.2, 0.4, 0.5, 0.8 and 1ml was taken in six different test tubes. In two different test tubes 0.1ml and 0.2ml sample extract was taken and volume was constituted to1 ml in all the test tubes. To each test tube, 5ml of alkaline copper solution was added, mixed well and allowed to stand for 10 minutes. Then 0.5ml of FC reagent was

added and incubated at room temperature in dark for 30 minutes to develop blue colour. Absorbance was read at 660 nm. A standard graph wad drawn and amount of protein present in the sample was calculate from the graph.

Lipid content: For analysis of lipid content, 100 gm sample of fresh or frozen tissue was homogenized for 2minutes with a mixture of 100 ml chloroform and 200 ml methanol and 50ml of chloroform was again added into the mixture. After blending for 30seconds, 100ml of distilled water was added and blended again for 30seconds. The homogenate was filtered through filter paper on a funnel. When the residue became dry, pressure was applied with a bottom of a beaker to ensure maximum recovery of the solvent. The filtered was transferred to a 500 ml graduated cylinder. Then it was kept for few minutes for complete separation and clarification. The choloroform layer was measured (150 ml) and the alcoholic layer was aspirated out. The remaining chloroform layer was also removed to ensure complete removal of the top layer (the chloroform layer contains the purified lipid). For quantitative lipid extraction the lipid withheld in the tissue residue was removed by blending the residue and filter paper with 100ml-50ml chloroform. The mixture was filtered through the blending jar and residue were rinsed with a total of 50ml chloroform. The filtrate was mixed with the original filtrate prior to removal of the alcoholic layer. Weight was taken.

Determination of pH: To determine pH, 1 gm sample was homogenised in 10ml distilled water and the mixture was filtered. The pH of the filtered was measured using a pH meter (Cyber scan 510).

Total Carbohydrate content: Carbohydrate content was determined by Anthrone method. For this,100mg of sample was weighed into a boiling tube and hydrolysed by keeping it in a boiling water bath for 3 hours with 5 ml of 2.5 N HCL. After cooling at room temperature it was neutralised with solid sodium carbonate until the effervescence ceases. The volume of the content was made up to 100 ml and centrifuged. The supernatant was collected and 0.5ml and 1ml of it was taken aliquots for analysis.

Different aliquots of standard solution, 0.0,0.2,0.4,0.6,0.8 and 1ml was taken in six different test tubes. In two different test tubes 0.1ml and 0.2ml of sample extract was taken and then reconstituted upto 1ml with distilled water. Anthrone reagent of 4ml was added and heated for 8 minutes in a boiling water bath. Then the test tubes were cooled rapidly and absorbance was taken at 630nm. A standard graph wad drawn and amount of carbohydrate present in the sample was calculated from the graph.

Calculation: carbohydrate present in 100mg of sample = (mg of glucose/volume of the test sample) × 100

Antioxidant activity: The antioxidant activity of dry fish was evaluated by DPPH radical scavenging assay, which was originally described by Blois (1958). DPPH (1,1-diphenyl-2-picrylhydrazyle) is considered as a stable radical because of the paramagnetism by its odd electron.

DPPH (0.002gm) was mixed with 100ml of methanol and stored in a refrigerator for 1 day inside an Amber bottle. In 5 test tubes different concentrations (25, 50, 75, 100 and 150ml) of the dry fish extract were taken and 1ml of DPPH solution was added to each test tube. Then in every test tube the volume was adjusted up to 2ml by adding methanol. Pure methanol acts as blank and DPPH solution serves as control. The test tubes were incubated in the dark for 30 minutes. After the development of green colour (after 30 minutes) absorbance was taken for each test tubes at 517nm. Scavenging activity was calculated by using this formula:

Scavenging activity (%)= [(A-B)/A]100

A=Absorbance of control
B= Absorbance of sample

4. RESULTS AND DISCUSSION

The proximate analysis of the fish samples has been summarised in Table 2. Moisture content varies from 9.09 to 21.67% with higher value recorded in the fish sample *Chanda nama* and lower in *Puntius sophore*. “Hentak”, a paste of dry fish, also from Manipur, have higher amount of moisture content then that of “jakot diya mass” [10]. “Gnuchi”, is a traditional smoke fish product of the Lepcha community of Sikkim, have a moisture content of 14.3% [11]. Traditionally smoked fish product is called “suka ko maacha” by the Gorkha having moisture content 10.4% [11]. “Sidra”is a sun-dried fish product commonly consumed by the Gorkha which have a moisture content of 15.3% [11]. Sukuti is also very popular sun-dried fish product cuisine of the Gorkha having moisture content 12.7% [11]. “Karati”, “bordia” and “lashim” are sun dried and salted fish products of Assam having moisture content in the range of 9.6-12.0 %. [11].

The concentration of protein content ranges from 40 to 116 ug/mg. The highest amount of protein concentration found in *Mystus tengara* and the lowest amount of protein concentration found in *Lepidocephalicthysguntea*. The protein content of “Ngari” is 38.38% and “Hentak”, a paste of dry fish,

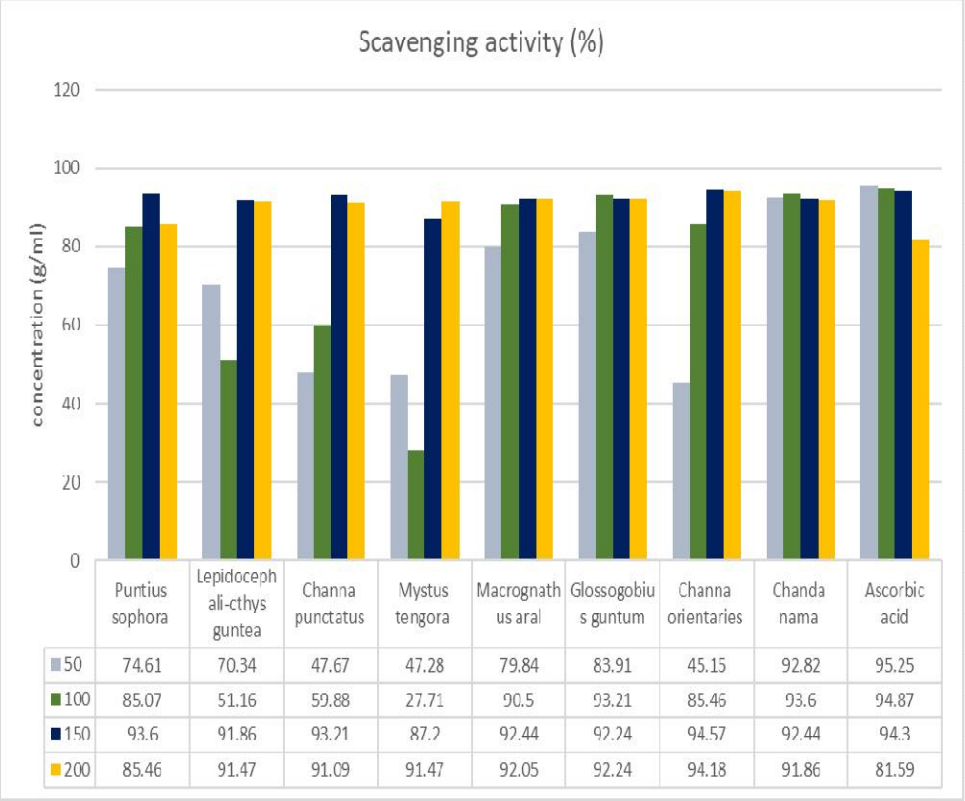
Manipur, have 33.38% of protein content [10]. "Tungtap", a fermented fish paste of Meghalaya has 32% protein content. "Gnuchi", is a traditional smoke fish product of the Lepcha community of Sikkim, have a protein content of 21.3% [11]. "Suka ko maacha" by the Gorkha having protein content 35% [11]. "Sidra"is a sun-dried fish product by the Gorkha which have a protein content of 25.5% [11]. Sukuti have 36.8% of protein content [11]. "Karati", "bordia" and "lashim" having protein content in the range of 24.5-35% [11]. By comparing with these all types of fermented fishes "jakot diya mass" could be an important source of protein content.

The lipid contents found in the range of 1.2gm to 17gm per 100mg sample. In *Lepidocephalicthys guntea*, the amount of lipid is higher among the all eight fish species. The lipid content of "Ngari" is 13.34%. "Hentak", a paste of dry fish, Manipur, have 13.38% of lipid content [10]. "Tungtap", a fermented fish paste of Meghalaya has 12% lipid content. "Gnuchi", has a lipid content of 14.5% [11]. "Suka ko maacha" by the Gorkha having lipid content of 12% [11]. "Sidra" have a lipid content of 12.2% [11]. Sukuti have 11.4% of lipid content [11]. "Karati", "bordia" and "lashim" having lipid content in the range of 11.8-12.4%. According to these *Puntius sophore,Lepidocephali-cthys guntea and Chanda nama* have a satisfactory amount of lipid.

The experiment also indicated that the fish sample is a good source of carbohydrate. Among the all species *Channa puctatus* contain highest amount of carbohydrate. The range of carbohydrate of "jakot diya mass" varies from1.22-1.46%. The carbohydrate content of "Ngari" is 31.6%. "Hentak", a paste of dry fish, Manipur, have 38.7% of carbohydrate content. "Tungtap", a fermented fish paste of Meghalaya has 37.1% carbohydrate content. "Gnuchi", have a carbohydrate content of 47.3% [11]. "Suka ko maacha" having carbohydrate content of 36.8% [11]. "Sidra" have 45.7% [11]. Sukuti have 38.2% of carbohydrate content [11]. "Karati", "bordia" and "lashim" having carbohydrate content in the range of 38.1-47.9% [11].

The pH of fermented samples showed values in the range 5.79 to 6.08. The pH of the other types of dry or fermented fishes of north-east India ranges from 6.2-6.5.

The dry fishes also show antioxidant activity against free radical DPPH. Highest value antioxidant activity found 94.57% in *Channa orientaries.*



	Puntius sophora	Lepidocephali-cthys guntea	Channa punctatus	Mystus tengora	Macrognathus aral	Glossogobius guntum	Channa orientaries	Chanda nama	Ascorbic acid
50	74.61	70.34	47.67	47.28	79.84	83.91	45.15	92.82	95.25
100	85.07	51.16	59.88	27.71	90.5	93.21	85.46	93.6	94.87
150	93.6	91.86	93.21	87.2	92.44	92.24	94.57	92.44	94.3
200	85.46	91.47	91.09	91.47	92.05	92.24	94.18	91.86	81.59

Graph 1. Antioxidant activity of eight dry fish sample at four different concentrations

Table 2. Proximate composition of eight dry fish from Kaikara Village of Mangaldoi

Names of the fishes	% of Moisture content	Protein Content (µg/mg)	Lipid content (gm/100mg)	pH	Total Carbohydrate (mg/100mg)
Puntius sophore	9.09	103	8	6.08	21
Lepidocephalicthys guntea	20.27	35.25	16.6	5.90	1
Channa punctatus	10.62	87.25	2	5.95	41.5
Mystus tengara	9.41	82	4.6	6.02	0.5
Macrognathus aral	20.45	80.25	4.2	5.79	1
Glossogobius gutum	12.95	87	1.2	5.87	2.2
Channa orientalis	10.89	84	5.4	5.96	1.5
Chanda nama	21.67	87	17	5.95	9

5. CONCLUSIONS

The dry fish samples collected from the village Kaikara, Mangaldai are used as side dishes by the people of that area. The eight dry fishes show good nutrient content. The result indicated that fermented fish samples could be a significant protein source. The experiment also indicated that the fish samples are also good source of carbohydrate. The dry fishes also show antioxidant activity against free radical DPPH. The present study deals with the development of starter culture compared with the indigenous method for fish drying which is tedious and time consuming.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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