Masular – A traditional fish product of Tharu community of Nepal

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This paper focuses on the preparation and quality evaluation of Masular, a traditional food of Tharu community of Nepal. A survey was performed prior to product preparation. The proximate and microbiological analysis and yield and cost calculation of the final product was carried out. The moisture content, crude protein, crude fat, crude fiber, total ash, and carbohydrate content of Masular was found to be 10.12%, 41.51%, 13.97%, 4.77%, 20.11%, and 7.62%, respectively. The microbiological analysis of the product revealed the total plate count to be 9.6 ± 1.6x10⁵ cfu/gm, Staphylococcus count to be 6 ± 1.5x10⁵ cfu/gm and mold count to be 25 ± 1.2x10² cfu/gm, and negative results for Salmonella and Shigella. Nutritionally rich Masular could be prepared at lower cost.

Keywords: Masular, Traditional food, Tharu, Sidra, Quality evaluation, Deepawali

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Traditional foods are those foods originating locally in an area with respect to the country, region, and district or sub-district and concern with religions, castes, etc. Many traditional foods have no recorded manuals. The tradition of verbally handling on the skill is still extant¹. They do not have any written documents about their preparation, processing, quality control methods. The teaching of food preparation method is learnt by “doing and learning” system, passed on from one generation to another¹². Traditional foods are increasingly attracting the interests as they are capable of combating the problems of food and nutrition security facing across the globe. Traditional food systems link the social and economic resilience of farmers to the sustainable food and nutrition security of global population³.

Masular is a dry food, prepared from dry fish (Sidra) and bottle gourd leaves (Lagenaria siceraria Standl.), mashing them together in Okhali/Dikki and finally giving shape similar to that of pancake, followed by sun drying. It is a traditional food product of the Tharu community of Nepal. Literally, ‘masu’ means fish and ‘lar’ means syrup or soup. The preparation is limited to household level. The final product bears its characteristics of dry fishy odor as it prepared from Sidra. It is mainly prepared for consumption during Deepawali, but it can be prepared in any season of the year. It serves as side dish or main dish (in unavailability of vegetables). The method of cooking and serving Masular is given in Fig. 1. It is relished by people of all ages. Tharus praise the product due to the reasons of availability of raw materials, i.e Sidra and bottle gourd leaves, ease in preparation of product, shelf-life of 2-3 months and considered to be rich in protein and vitamin.

Sidra is the local name of dried fish especially of Puntius spp and is prepared traditionally by cleaning, washing and drying the fish as shown in Fig. 2. Fish is an excellent source of protein, essential amino acids, polyunsaturated fatty acids, minerals and vitamins. Consumption of fish provides an important nutrient to a large number of people worldwide and thus makes a very significant contribution to nutrition. The nutritional values of dry fish have been given by many researchers. They are a rich source of protein⁴⁻⁶. The small indigenous fishes are micronutrient rich and cheap sources of quality animal proteins. In a comparative study, it was found that the nutrient profile of small fish Puntius sophore was much higher than Indian major carps like L. rohita, C. catla and C. mrigala⁷. The medicinal

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benefits of bottle-gourd have been claimed in Ayurveda. It is one of the excellent fruit composed of all the essential nutrients required for the normal and good human health possessing antioxidant activity, analgesic and anti-inflammatory activity, anti-hyperglycemic and anti-diabetics, anti-hyperlipidemic activity, antimicrobial activity and anti-helminthic activity, cytotoxic and anticancer activity. It has been found experimentally to cure a number of diseases such as sleep disorders, seizure disorders, anxiety, diabetes mellitus, hyperlipidemia, worm infection and cancer. The leaves are good source of fibre, minerals such as calcium and iron and vitamin A and vitamin C.

There have been quite intensive studies on physical, chemical and microbiological characteristics of traditional fish products. But there are no any written manuals or scientific documents of Masular. Ngari, hentak, shidol, hukoti and numsing are some of the traditional fish products that are similar to Masular and their scientific study regarding processing have been initiated. Ngari is a dry and fermented fish that is eaten either in the form of chutney or mixed with other curries. Hentak is prepared in Manipur, India by mixing powdered, dry fish with crushed stem of colocasia. Traditional fermented fish product Shidol is very popular in Northeast India. In the same way, Hukoti is very popular in the tribal communities of Upper Assam, India. Dressed and washed fish (Puntius spp) are ground with de-skinned stem of Alocasia macrorrhiza Schott and leaves of Siju, and the paste is stuffed and dried over kitchen fire. Numsing is a fermented product of Mising tribes of Upper Assam, India prepared from small fishes and petioles of Alocasia macrorrhiza. All these products resemble Masular in one way or other. The information on the preparation and processing of Masular is yet to be scientifically explored. The nutrient composition is still unknown. The knowledge on the traditional food is limited to household level. Hence, aims of this study were to find out the nutritional and microbiological qualities of the product so that they could be promoted to commercial level and open a door for further research.

Methodology

Survey

A survey based on a set of questionnaire was conducted adopting Participatory Rural Appraisal (PRA) approach in March 2012 regarding the preparation and processing of Masular in the Tharu community of Gourishankar-VDC of Sarlahi district, Nepal (26°58’ N 85°43’ E). Prior informed consent (PIC) was taken from the participants to share the information. Six wards (1 to 6) of the VDC were chosen owing to the dense population of Tharus. The informants were randomly selected regardless of age and sex.

Materials

The Bottle gourd leaves (Lagenaria siceraria) and the dry fish Sidra (Puntius spp) were collected from Balwa Sokanaha village, Gourishankar-V D C, Ward-2 of Sarlahi district of Nepal. The bottle gourd leaves were collected fresh from its plant, and leaf should not be fully matured.
Product preparation

The product was prepared following in traditional method (Fig. 3). The fresh fish Swamp barb (*Puntius* spp) was cleaned and scales removed. It was then partially dried in the sun for 6-8 hrs which was later manually eviscerated. It was then dried in the sun to a moisture content of 6-8 %. The dried fish is called Sidra. Sidra was then manually cracked into smaller pieces. The fresh and tender leaves of bottle gourd were plucked and cleaned with potable water. The leaves and *Puntius* spp are shown in Fig. 4 & 5, respectively. They were then drained and allowed to wilt for about an hour. The wilted leaves were finely ground in *Okhali* (local mortar-pestle).

The Sidra and leaf-paste were mixed in the ration 1:1 by weight and ground to make a homogenous batter. The batter was then manually mould into the shape like that of pancake (Fig. 6) with diameter 6-7 cm and thickness 0.5-0.7 cm. It was then partially sundried. The product was pierced at the center to facilitate hanging. The pierced product was hung in rope at a distance of 2 cm to facilitate drying. Fig. 7 shows the pierced ready for drying in the sun. The product was covered with net and then left for sun-drying. The drying process continued till the moisture content of the product 8-11 % approximately. The dried masular were then hung over the oven (Fig. 8) for future use.

Yield and cost calculation

The yield and cost calculation of the product was done based on the value of raw materials.

Chemical analysis

Moisture content, crude fat, crude protein, crude fiber and total ash were determined by following AOAC procedures. The moisture content of the sample was determined by Hot Air Oven method. The samples were kept in an oven at 105 ± 2 °C until constant weight was obtained. The crude protein and crude fat contents were estimated by Kjeldahl and Soxhlet’s methods respectively. Crude fibre was reported as weight loss on igniting the dried residue remaining after digesting the extracted sample with 1.25% H$_2$SO$_4$ and 1.25% NaOH under specific conditions. Ash content was determined by incinerating a known weight of sample at 600 °C for 6 hrs in a muffle furnace.

Microbiological analysis

The microbiological analysis for total plate count, coliform, yeast and mold count and *Salmonella* and *Shigella* was done using standard methods. Total plate count was determined by dilution plate method using Plate Count Agar and sterile distilled water as diluent. Coliform was detected by Most Probable Number (MPN) method. Yeasts and mold count were determined by dilution plate method using Potato Dextrose Agar. Samples were tested for the presence of *Salmonella* and *Shigella* using Salmonella Shigella Agar. Microbial populations were expressed as the average colony-forming units per gram (cfu/gm) of triplicate samples.

Data analysis

Samples were analyzed in triplicates and data analyzed for mean using Microsoft Excel 2007®.

Results and discussion

Table 1 shows the nutritional composition of Sidra, bottle gourd leaves and Masular. The mean value of moisture, crude protein, crude fat, crude fiber and ash content in Sidra were found to be 8.73, 45.28, 17.49, 2.32 and 22.77 gm / 100 gm, respectively. The values were close with that found in previous studies. Similarly, the mean value of moisture, crude protein, crude fat, crude fiber and ash content in bottle gourd leaves were found to be 90.23, 3.066, 0.32, 1.67 and 0.89 gm/ 100 gm, respectively. The composition was found to be at par with the available literature. *Lagenaria siceraria* is one of the excellent
fruit composed of all the essential nutrients required for the normal and good human health. The antioxidant activity and other medicinal effects of various extracts of epicarp, mesocarp and pulp of *Lagenaria siceraria* have also been reported. Hence, it is supposed that the leaf might also possess health benefits. *Masular* contained 10.12 % moisture, 41.51 % crude protein, 13.97 % crude fat, 4.77 % crude fiber and 20.11 % ash. There is an increase in moisture content and crude fiber in *Masular* as compared to *Sidra*. This might be due to the addition of bottle gourd leaves. The decrease in crude protein, crude fat and ash content might be due to the dilution effect of leaves on the final product. However, the differences might not be nutritionally significant. There is close resemblance in the method of preparation and consumption between *Masular* and *Hukoti*, *Hentak* and *Numsing* which are praised for their nutritional and medicinal values. *Masular* is very nutritious food with high protein content. It is also rich in fiber and minerals. Bottle gourd leaves might contribute to increasing its therapeutic value. Hence, this product could reduce the problem of malnutrition prevalent in the country too.

Table 2 shows the microbiological profile of *Masular*. The total microbial load in the product was 9.6±1.6×10^5 cfu/gm. Yeasts and molds and *Staphylococcus* were detected in the product while *Salmonella* and *Shigella* were nil. In a study, it was reported that the total plate count of *Shidol* was found to be 5.1-5.4 log cfu/gm. Similarly, few yeast and mold colonies (1.2-1.7 log cfu/gm) were observed. In another study, it was found that the count of *Staphylococcus aureus* were less than 10^3 log cfu/gm in *Hentak*, *Ngari* and *Tungtap*. Tanasupawat *et al.* reported that gram positive *Staphylococci* with positive catalase activity was found in the fermented fish. Several strains of *Staphylococci* were isolated from the fermented fish of Thailand. *Staphylococcus* count exceeding 10^6/gm is considered to be hazardous. The presence of small number of *Staphylococcus* in fishery products is not a serious problem but food poisoning may occur if the product is handled carelessly during processing which may result in multiplication of the organism. In the process of *Masular* preparation, the use of poor quality raw material and water, unhygienic processing conditions and methods, sun-drying of fish in open environment using *nanglos* might result in increase of the microbial count. The
presence of the microorganisms is attributed to poor handling practices and sanitation condition of the processing area. The microbial growth can be prevented by the control of hygiene, sanitation and water quality.

1 kg of raw material on equal basis yielded 677 gm of Masular after drying. Hence, the yield of the product was found to be 67.7%. The cost of the product was calculated to be Rs. 212.70 per kg (Table 3). This cost is low as compared to other protein sources such as mutton (Rs. 650 per kg) and fish (Rs. 250 per kg). Hence, protein rich Masular was available at a lower cost.

Medicinal value of Masular

It is general belief of the elder Tharus that Masular possesses numerous medicinal properties. They say it is because of addition of bottle-gourd leaves. It is claimed to have cooling effect and cure urinary disorders and diarrhea. Masular also acts as remedy to constipation and digestive disorders. Because of fish-bones, consumption of Masular is believed to make bones and teeth strong. But the authenticities of these claims have not been scientifically addressed.

Significance of the study to the society/researchers

Masular is a nutritious food rich in protein, fiber and minerals. This traditional food can address the problems of food and nutrition security. But, this knowledge should reach a wide mass of people crossing the traditional boundary. Promotion and commercialisation of the product needs to be done. This will strengthen the nutritional status and helps to improve livelihood. Dissemination of knowledge regarding the hygiene and sanitation practices during preparation is a must. Villagers must be well-trained on handling practices, processing methods and storage technologies. Researches on product formulation, standardisation and shelf-life studies can be extended. Masular is claimed to have many beneficial and medicinal effects. Research and documentation on the medicinal aspects of Masular has not been done. Hence there is an ample scope of further research.

Conclusion

The study on the compositional analysis of Masular showed that it is highly nutritious with rich source of protein and minerals, and microbiologically it is safe to eat. It was found that the traditional food can be prepared at lower cost (Rs. 212.7 per kg) by utilizing the locally available ingredients like dry fermented fish Sidra and locally available bottle gourd leaves. Its promotion and commercialisation could be a tool to achieve food and nutrition security and strengthen the livelihood of the people.

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References

4. Kakati BK & Goswami UC, Characterization of the traditional fermented fish product Shidol of Northeast

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Cfu/gm</th>
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<tr>
<td>TPC</td>
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<tr>
<td>Mold count</td>
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<td>Staphylococcus</td>
<td>6±1.5x10^3</td>
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<td>Salmonella</td>
<td>ND</td>
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<tr>
<td>Shigella</td>
<td>ND</td>
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All values are mean ± standard deviation of three determinations, ND = not detected

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<tr>
<th>Headings</th>
<th>Amount, kg</th>
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<th>Total cost, Rs.</th>
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<td>Sidra (dry fish)</td>
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* $1.00 (US) = Rs.80.95 as of 29 March 2012
India prepared from *Puntius sophore* and *Setipinna phasa*, *Indian J Tradit Knowle*, 12(1) (2013) 85-90.


14 Website:http://www.mcgill.ca/cine/sites/mcgill.ca.cine/files/karen_datatables_flowers_vegetables_dec11_0.pdf


23 Iyer TSG, Pathogens and faecal organisms in fish and fishery product, In: *Quality control in Fish Processing*, (Central Institute of Fisheries Technology, ICAR, Cochin, Kerala, India), 1979, 45-59.