Available online at http://www.journalijdr.com

IJDR

International Journal of
DEVELOPMENT RESEARCH

ISSN: 2230-9926

International Journal of Development Research
Vol. 07, Issue, 06, pp.13358-13360, June, 2017

Full Length Research Article

PROSPECTS OF TRADITIONAL FISH PRODUCTS AND FISH WASTE IN THE RED SEASTATE, SUDAN

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ARTICLE INFO

Article History:
Received 04th March, 2017
Received in revised form
29th April, 2017
Accepted 15th May, 2017
Published online 30th June, 2017

Key Words:
Fish waste,
Traditional Fish products,
Food Security,
Red Sea,
Sudan.

ABSTRACT

This study aimed to estimate the consumption of the traditional fish products(Faseikh and Maloha), and to determine the amount of fish waste, fish discard, fish losses and their proximate composition to investigate their contribution in the household food security in the Red Sea State. The study adopted the analytical descriptive approach to verify and specify the research issues quantitatively and qualitatively. It depended on questionnaire and personal communications as primary sources for data collection; the experimental approach was adopted to measure the proximate composition for fish waste and traditional fish products. The results obtained estimated the average consumption of traditional fish products as42000kg and12000kg per year for Maloha and Faseikh, respectively. The average fish waste in Port Sudan fish market is about 634kg per day (16.15%) of the daily landing. On the other hand the daily loss due to spoilage in Port Sudan fish market was estimated as 50kg this was equivalent to 1.25% of the average daily landing.
The results showed that about 91.4 % of families discarded parts, like fins, viscera, ovaries and gills to garbage containers. The values of protein, fat, ash and fiber for the fish waste were 62.4%, 6.4%, 18.6% and 3.4% and were 22.5%, 4.2%, 7.15%, 39.15% and 17.4%, 5.4%, 5.45% and 53.4% for Faseikh and Maloha, respectively.

INTRODUCTION

Fish is the primary source of animal protein for 17% of the world population. It contains omega3oil and micronutrients which are vital for human health, especially children and pregnant women, (HLPE report 2014). Almost 40 to 50% of fish catch is thrown away as waste. This waste is highly perishable because its high moisture and protein content render it as an ideal medium for growth of microorganisms. If this waste is left unattended, it produces off odor and cause pollution problems (Nithin, *et al*. 2013).The waste from fish cleaning shouldn't be disposed off in to a marine basin or garbage containers to minimize environmental hazards. However, such waste could be utilized as source of protein ingredients in animal, poultry and fish feeds. According to FAO (2014) the portion of capture fisheries used to produce fish meal is about 23% of the total catch and it will be reduced to 17% by 2021.

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Owing to the growth of demand for fish for human consumption, and to better use of fish waste, there will be increasing proportion of fish meal that derived from fish waste by 2021. Fish meal should be 15% higher than the average now, y*et al*most 80% of the increase will be derived from improved use of fish waste, which is expected to amount to 43% of fishmeal production by 2021. Fish becomes spoiled within 12 hours at tropical regions when a complicated series of chemical and bacterial changes are triggered by high temperature (ILO, 1989). Spoilage depends on the temperature and water activity of the fish and the presence or absence of the various spoilage microorganisms. Artisanal fish processing remains the predominant and most important method of fish preservation in Africa. The principal methods are salting, fermentation, drying and smoking (FAO, 1981). Fish processing in Sudan is by salting, drying, fermenting and smoking (FAO, 1999).The history of fermented foods has early records in Sudan. The Sudanese fish products include kejeik (large sun-dried split fish); Fasiekh (salted fermented whole *Hydrocynusspp* "Kass", *Alestesspp* "Kwaraa" and *Labeospp* " Dabs"); Mindeshi (pounded small fish paste, fermented, and may be dried later); and Terkeen or Maloha (fermented fish sauce or paste) (Dirrar, 1993).

Fasiek his the most popular fish food in Sudan and it is sold either wet or dried and distributed all over the country where local demand is very high. As consequence, its price highly exceeds the price of fresh fish. Another is Seer, a very small fried fish sold cheap. The home made Terkeen encourages the use of illegal gear, since the smaller the fish size the higher the market value of this product. The poultry industry is also obtaining undersized fish for preparation of chicken feed (FAO, 1999). El Haj (2006) addressed the methods for improving salted – fermented two fresh water species Kawara (*Alestes sp.*) and Debs (*Labeo sp*.) from Sudan River Nile. Mohamed (2009) studied the biochemical composition of three marine wet- salted fishes (Fasseikh)and also described the methods of salt fermentation for three marine fishes namely Arabi (*Mugil cephalus*), Salmani (*Chanoschanos*) and Kass (*Gerrus oyena*) collected from the Red Sea Coast, Sudan.

MATERIALS AND METHODS

Study area and duration

The study was conducted in Port Sudan and Swakin localities-Red Sea State in the period from Dec. 2014 till Jun. 2015.

Data collection

The questionnaire designed to collect data on fish consumption, was divided in to two parts: the 1st part was personal and demographic data of the sampled population. The 2nd part was primary data concerning household fish consumption.

Sampling techniques

The field survey was performed in eastern, central and southern Port Sudan and in Swakin. The total number of families in the study area was 96675 families according to Sudan Census, 2008. The sample was selected randomly with expected level of response 50%, confidence limits 95% with error level 0.05s (Raosoft, 2014). The sampled population accordingly was 662 families from the 4 sectors.

Fish waste collection

Garbage plastic bags were distributed to cleaners and processors in the fish market at Port Sudan. Fish waste was collected and weighted at the end of the day, for 3 successive days during Jan.2015, at the same days the amount of fish landing was recorded. Percentage of the fish waste was then calculated.

Biochemical analysis

One kg of random samples of fish waste (head, scales, guts, bones, etc.) from each day was collected and dried at room temperature for seven days then prepared as dried powder in an electric oven at 60C° for 24hours. The standard methods of AOAC (2000) were used to determine moisture, protein, lipid and ash.

Preparation of Faseikh

Arabi (*Mugil cephalus*), Salmani (*Chanos chanos*) and Gdrneeb *(Plectrohynchus gaterinus*) were gutted kept in plastic container, the salt then applied in layers, using from 1 to 2 kg of salt per 3 kg of mullets fish. A final layer of salt is applied on top and the container was closed tightly for 15-21 days. During this time, water and fat were extracted out of the container. The extract was then collected and later used to spray the mullets during the cure.

Preparation of Maloha

Arabi (*Mugil cephalus*), Salmani (*Chanos chanos*) and Gdrneeb *(Plectrohynchus gaterinus*) were gutted and cut into pieces to fit in the metalcontainer (small fish may not be gutted), the fishes then washed in sea water and arranged in the containers (metal bowls) in alternating layers of fish and salt; the ratio of fish to salt was 3:1. After adding little amount of water the fish was heated until nearly cooked. After draining most of the liquid from the bottom of the container, more salt was added to fish on the surface and cooking continued until no free water remains in the bottom of the container. The top of the container was sealed with plastic cover for one month.

Traditional Fish product proximate analysis

Two random samples of locally made fasiekh and two maloha from Swakin were analyzed according to A.O.A.C (2000).

Data analysis

SPSS programme was used to analyze the collected data.

RESULTS AND DISCUSSION

Fish waste

Survey was made in Port Sudan Central Fish Market found that the percentage of fish waste is16.15% of the average total landing (Table1). This resources should be utilized as a valuable ingredient in fish, poultry and animal feeds. The composition of the final products depends on the kind of raw material and on the type of processes.

A whole meal made from fatty fish like herring might contain about 71% protein, 9% fat, 8% waste and 12% mineral , whereas a meal made mainly from white fish and white fish offal and dried to the some extent will contain about 66% protein , 5% fat, 8% water and 21% mineral(FAO,2014). Many families (32.4%) considered discarded heads of the fishes as a loss since the head weight ranged between 28 – 30% of fish weight and were known as highly nutritive when prepared as a soup. Processing of waste create chances of work and income generation for the fisher communities and related sectors FiFish.

Table 1. Total fish landing and fish waste in Port Sudan fish market in Kg.

Date	Total landing (kg)	Fish waste (kg)	Fish waste (%)
1/1/2015	5300	792	14.94
2/1/2015	3950	606	15.34
3/1/2015	2771	504	18.18
Means	4007	634	16.15

The gross chemical composition of fish waste was given in table 2. The composition indicated reasonable amount of calories (355.81Kcal) and high digestibility of waste due to low fat to protein ratio (0.103:1.00).

Table 2. Gross chemical composition of fish waste collected from Port Sudan fish market

Parameters	Mean %
Moisture on wet basis	84
Ash on dry basis	18.56
Protein on dry basis	62.39
Lipid on dry basis	6.44
Fiber on dry basis	3.39
Caloric value	355.81
Fat: protein	0.103:1.00

Table 3. The gross chemical compositions of traditional fish products

Parameters	Faseikh of salt water fish	Maloha of salt water fish
Moisture (%)	62.28	62.63
Ash (%)	4.20	3.95
Protein (%)	22.51	17.45
Lipid (%)	7.15	5.35
Fiber (%)	39.15	53.35
Caloric value	346.5 Kcal	369.43 Kcal
Fat: Protein	0.318:1.00	0.647:1.00

Traditional fish products, (Maloha and Faseikh)

There was considerable consumption of traditional fish products, particularly maloha in the Red Sea State. Around 6 - 8 traders imports maloha to the State from Khartoum, with an average of 25 plastic buckets (bucket = 20kg) per trader per month. The average price of the bucket was 350SDG (Salih, personal communication). The Red Sea State consumption of maloha was estimated as 3500kg per month, the consumption will drops in summer season. Some efforts have been made through the UNIDO project "Recovery of coastal livelihood in the Red Sea State" to introduce such activity within the established women societies (UNIDO, 2009).However, these societies were facing problems in marketing; thus, they made the products upon request and/ or in occasions. Mohamed (2009) managed to produce faseikh from *M. cephalus*, *C. chanos* and *G. oyera* using three levels of salt concentrations. The monthly average consumption of faseikh was about 1000kg and with an average price of 30SDG per kg (Al Gony, personal communication).This product was imported from Khartoum and Al Dowaim. In addition to that manually processed Faseikh mentioned above there was a manufactured Faseikh, this was distributed in different shops and groceries, however, it was difficult to estimate the rate of consumption of such product. The study indicated that about 62.1 % of the population under study used to eat Fasiekh and Maloha and about 61.5 % used to have canned fish products. This high rate calls for establishing enterprises in the Red Sea State to produce Fasiekh and Maloha as tha annual consumption was about 42 tons per year for Maloha and 12tons per year for Faseikh.

Proximate analysis of traditional fish products

The proximate composition obtained for protein, ash, fat, fiber were 22.5%, 4.2%, 7.15%, 39.15% and 17.4%, 3.95%, 5.35%, 53.35% for Faseikh and Maloha, respectively (Table3).

Conclusions and Recommendation

Food security requires making better use of fish and fish produced by reducing post-harvest losses and increasing the percentage of fish used for direct human consumption. The improvement of fish handling and preservation would greatly reduce such losses. Production of fish meal would increase the contribution of fishery sector to household food security in the Red Sea State. There considerable demand for traditionally processed fish products in the Red Sea State; this is an area income generation if production from marine fish implemented.

Acknowledgement

The authors are grateful to Food & Agriculture Organization of the United Nations (FAO) for their financial support. The Acknowledgments are extended to the Red Sea University (RSU) & Marine Fisheries Administration (MFA) for their cooperation& support. Special thanks to the staff of the Institute of Marine Research (IMR), Red Sea University for hosting the task of the research project.

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