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Biochemical Study on Terkin: A Fermented Fish Product

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Abstract

This study was carried out to investigate biochemical analysis of fermented fish product 'Terkin', and the biochemical quality of oven-cooked laboratory made Terkin .Twenty Six samples of oven- cooked and sun-heated Terkin were collected from different households in various parts in the Sudan and from factories (Khartoum Fishing Company and Huda Fish Company). The analysis (%dry wt.) of unfermented fish showed 18.7 ash, 74 protein, 4.0 fat, 2.2 Ca, 0.4 Na and 3.4 Mg. The protein and fat contents during fermentation ranged from 41.3 to 66.2% and 5.5 to 11-5%, respectively. The fresh fish had a moisture content of 77. 3% and a pH value of 7.0.

Keywords: Terkin, Khartoum Fishing Company, Oven – cooked laboratory, Sudan

INTRODUCTION

Traditional fermented fish products have long been known in the Sudan. Dirar (1993) reported that Terkin in related to sauce such as nouc-mam ,Nam-pla and Budu as well as to the poote such as Bagoong, Pra-hoc and Shiokara. The area famous for its production and consumption is centered around Dongla, the ancient town of upper Nubia. The region has along tradition in fish products and

Terkin seems to carry a tag of antiquity (Besyuni,1979) . The word Meluha comes from the Arabic word milh meaning salt, so that the word Meluha was originally memluha (salted), probably. The Arabic name Meluha has replace the African name, Terkin, judging by what has happened to many other foods of the Sudan. The major consumption area for Terkin is Nobia . Today, the primary production area is the White Nile, particularly at the centers of Jabel Awlia and Kosti town. It is believed that the kunuz tribe (of Arabian origin) of the border between Egypt and the Sudan, introduced the art of Terkin or Meluha making from Dongla into upper Egypt and later, as they migrated south into the white Nile area .Terkin production is in the hands of Danagla women who inhabit scattered village on the banks of the White Nile.These women produce commercial Terkin which has been estimated to amount to some 200 tons per annum[(3)] .Terkin is considered an important source of protein and minerals such as sodium and calcium. Sudanese people use it sometimes as the only source of animal protein throughout the year as substitute for meat, particularly in the Central Nile Valley. Terkin is probably the only paste in Africa and the Arab world, as dirar (1993) mentioned there are two basic ways to prepare the Terkin, the first is the Meluha naya (raw Terkin) and the second is the Meluha matbukha (Cooked Terkin) dish.

The main objectives of this work are summarized as follow:

1. Study of the biochemical composition of collected samples of Terkin.
2. Study of the biochemical and other changes during fermentation leading to the product.

MATERIALS AND METHODS

General Experimental Strategy

Twenty one samples from homes and five samples from commercial factories were collected and subjected to biochemical analysis. In addition, laboratory-made Terkin was subjected to similar analyses. Changes were followed during fermentation.

Preparation of laboratory-made Terkin

Fresh young fish were obtained from Jabel Awlia reservoir. Then about 2-3kg was processed in the laboratory as oven-cooked home-

made Terkin. The average value of the commercial salt: fish ratio was used, which was 1: 6. The procedure used was dry salting. This procedure was conducted by placing the fish into a petrol can for one day, without salting. The next day the fish was cooked on an open fire and the salt added while the fish was on the fire. The cured fish was mixed by periodic stirring and poking continuously, from dawn to dusk, until a homogeneous paste was obtained, while the product was still on the fire. Then the product was transferred to the petroleum can. Sampling was done as mentioned above. The assay time was 20 days at 4 days intervals.

Sampling Methods and Collection of samples

It was necessary to take large representative samples. Sampling was carried out with aseptic precautions. All containers used for sampling were previously wrapped and sterilized. Before sterilization, glassware were washed thoroughly and left to dry, then they were sterilized in a hot air oven at 160°C for at least 3 hours (Harrigan and McCance,1976). Samples of small fresh fish, namely kawara (*Alestes spp*.), kass (*Hydrocynus spp*.) and dabs (*Labeo spp*.) for processing in laboratory were obtained from fishermen immediately after landing from Jabel Awlia reservoir on the White Nile. These samples were collected in sterile glass containers, then transported (early in the morning) to the laboratory where biochemical analyses was carried out. The samples were minced through sterilized meat mincer and then mixed several times before biochemical analyses were carried out.

During laboratory processing of Terkin, the two samples for biochemical analyses were obtained aseptically before and after cooking on an open fire. The other samples were taken every 4 days for 5 times.

Commercial Terkin samples were collected from Jabel Awlia (Khartoum Fishing Company and Huda Fish Company) in sterile containers for biochemical analysis. Most of Terkin samples were obtained from different households in various parts in the Sudan ((Omdurman, Khartoum North, Sinnar, Dongola and Khartoum (mainly from Jabel Awlia))). The samples were originally brought in different containers, such as sterile glass containers, metal can containers and polyethylene bags. The samples were ground under

aseptic conditions and were stored in sterile jars at refrigeration temperature, waiting for biochemical analysis.

Proximate analysis

Protein, fat and ash contents were determined according AOAC (1990).

Moisture content

Was determined by the method described by AOAC (1980).

pH

The pH value was determined in 10% solution of sample as described by Newlander and Autherton (1964), using a pH meter (Model A005673-3-5).

Calcium, sodium and magnesium were determined according to Perkin-Elemer (1994) .

RESULTS AND DISCUSSION

Tables 1 and 2 show the proximate composition of oven-cooked and sun-heated home-made samples, respectively. It has been noticed from the results that the pH and protein contents of oven-cooked home-made samples were higher than those of sun-heated samples, while the ash and moisture content of oven-cooked samples were lower than those of sun-heated samples. The increase of pH is attributed to the action of proteolytic enzymes of bacteria on protein to produce alkaline ammonia. The high content of ash for the sun-heated samples may be attributed to the possibility that during hard stirring & mixing of Terkin in the earthenware pots some of the material in the walls of the pot must have dissolved in the Terkin. The low moisture content in oven-cooked samples indicates the evaporation of water due to heat treatment, while the sun-heated samples were subjected to sun rays only. It can be noticed from Table 1 and 2 that there is slight difference in fat content, Na %, Mg % and Ca %. The fat content result is in agreement with Agab and Shafie (1989) and Eltom (1989) who found that fat content of Fessiekh was 10.6-22.5 and 17.8-19.7, respectively. Dirar (1993) reported that the fat content of Fessiekh was similar to the fat content of Pedah.

Table 3 reveals the biochemical composition of commercial collected samples. It is noticed from the results that the moisture content of sample 2 was low, while the protein content was high, when compared with sample 3. This may be attributed to the different procedure used for Terkin preparation in both samples as described previously. In heat treatment, food loses its moisture content which results in increasing the concentration of the nutrients in the remaining mass. Also it has been notice that there is no difference in ash content, Ca %, Na % and Mg %.

In sample 22 which was stored for 6 months and sample 23 which was stored for 12 months, there are slight differences in all parameters which were examined, this indicates that the Terkin would be stored for 6 months and even for one year without change in its quality. Sudanese Standards and Metrology Organization(SSMO,2002) , reported that Terkin sample had no pathogenic bacteria and its shelf-life was one year.

Biochemical analysis of fresh fish is presented in Table 4. The typical analysis of fresh fish was pH 7.0, 18.7% ash content, 77.3% moisture content, 74.3% protein, 4.0% fat, 2.2% Ca, 0.4% Na and 3.4% Mg. Eltom (1989) reported that there were no systematic variations in proximate composition with fish type except of protein which is slightly lower in the case of shilbaya than in kass and kawara .

The protein content during fermentation ranged from 41.3 to 66.2 %. It appears that there is no systematic variation in protein content during processing . This result is in agreement with those reported by Mahmoud (1977) who found an average protein content of 48.66 ± 5.36 % D.W. for dry salted fish Fessiekh from *Hydrocynus spp.*

Van Veen (1965) found that protein content of Pedah Siam (a Fessiekh-like product) ranged between 21and22%. On comparing the protein content of fish before and after salting systematic differences were observed. The change of fish state has led to an increase in protein content as a result of moisture removal and concentration of the nutrient materials, it is evident that the protein content of processed fish has decreased after the course of salting.

Loss of protein during processing is extremely variable. In our results, the losses of protein during processing of Terkin averaged around 33%. This result is in agreement with those reported by Amano (1962) , who found that the loss average was 35% .

In Table 4 there is no systematic variation in fat content during fermentation, which ranged between 5.5 and 11.5%.

Table 1 : Proximate composition (% of dry wt) of oven-cooked home-made Terkin

Sample No.	pH	Ash content	Moisture content	Protein content	Fat content	Ca	Na	Mg
1	6.5	36.5	52.2	43.70	14.5	3.16	1.47	2.34
5	6.8	25.45	53.40	51.71	17.0	0.55	6.0	0.33
6	6.2	37.0	43.60	44.88	14.0	1.5	3.72	1.0
7	6.4	30.0	43.40	51.62	14.0	0.85	2.0	2.81
10	6.6	30.0	57.20	46.98	14.5	0.60	6.62	2.31
14	6.0	35.0	45.80	35.88	19.5	1.45	4.25	2.10
17	6.8	35.0	50.60	34.50	23.0	0.65	2.75	0.14
19	7.2	35.4	30.80	34.47	16.5	1.30	8.55	0.17
20	6.9	34.0	50.30	38.6	19.0	1.46	8.36	2.85
21	6.4	33.3	55.30	39.2	19.0	1.92	9.60	1.55
24	6.5	37.3	49.16	40.88	14.5	2.49	6.84	3.10
25	6.4	38.9	53.16	33.95	14.5	1.88	6.58	1.73
26	7.1	39.2	47.90	41.60	15.5	2.60	0.92	1.98
27	7.2	38.2	53.60	40.60	19.5	3.70	0.95	2.67

Table 2: Proximate composition (% of dry wt) of sun-heated home-made Terkin

Sample No.	pH	Ash content	Moisture content	Protein content	Fat content	Ca	Na	Mg
8	6.3	37.0	56.1	49.17	10.00	0.95	4.00	2.70
9	6.9	46.8	64.1	36.48	22.00	1.05	5.42	2.31
11	5.6	40.0	47.9	38.56	14.00	2.45	4.56	1.38
13	6.2	42.0	46.5	35.88	14.00	1.55	3.87	1.89
15	6.0	38.5	46.2	38.31	18.50	1.60	5.62	0.18
16	6.1	27.0	41.5	49.31	18.50	0.65	4.00	0.19
18	6.5	25.0	38.5	48.12	19.50	1.19	5.01	2.47

Table 3: Proximate composition (% of dry wt) of commercial Terkin samples

Sample No.	Factory	pH	Ash content	Moisture content	Protein content	Fat content	Ca	Na	Mg
2	Khartoum Fishing Company	6.5	38.7	43.6	47.20	14.5	4.45	1.49	1.80
3	Huda Fish Company	6.6	38.5	52.9	43.40	14.5	4.10	1.37	1.98
12	Huda Fish Company	6.2	38.5	47.5	38.38	10.5	1.50	4.12	1.89
22*	Huda Fish Company	7.0	33.0	51.1	36.13	23.5	2.25	6.81	2.12
23**	Huda Fish Company	6.6	37.4	45.8	42.52	13.5	2.02	7.60	2.25

* Stored for 6 months **Stored for 12 months

Table 4: Proximate composition (% of dry wt) of laboratory samples

Sample No.	Fermentation period	pH	Ash content	Moisture content	Protein content	Fat content	Ca	Na	Mg
1	Zero	7.0	18.7	77.3	74.3	4.0	2.2	0.40	8.40
2	1day	7.8	17.5	80.3	66.2	9.5	3.6	0.40	6.30
3	After cooking	7.4	11.0	69.8	73.5	11.5	1.1	0.50	1.92
4	4days	6.2	32.0	66.1	42.0	5.0	1.8	10.35	7.80
5	8days	6.0	33.0	56.4	49.0	7.0	1.3	10.00	1.86
6	12days	6.2	37.0	50.2	47.0	5.5	2.2	10.50	3.54
7	16days	6.3	39.0	44.9	44.6	5.5	1.4	8.25	3.12
8	20days	6.4	37.0	40.4	44.8	7.0	3.1	10.50	5.26
9	30days	6.4	35.0	34.6	41.3	5.5	3.0	10.06	6.25

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