Quality evaluation of fried fish sold in Sokoto Metropolis

Magawata I and Ahmad BL

Abstract

The quality of fried fish products sold within Sokoto metropolis was evaluated. Six samples were obtained from six locations each week (Arkilla, Dandima, Kwakwalawa, Sokoto Central market, Sokoto Old Market and Tashar Illela were taken to Faculty of Agriculture laboratory, Usmanu Danfodiyo University, Sokoto for proximate composition, bacterial determination and sensory evaluation. The result from the proximate composition revealed that crude protein and moisture varied significantly (P<0.05). The lipid content of the products were not significantly different (P<0.05). The results of the bacteria determination were found to be decreasing during the study period and this was because the samples were fresh fried products. Frying dehydrates the fish flesh and therefore kills many bacteria. The result of the sensory evaluation were found to be fluctuating during study period and there was significant difference (P<0.05) in the fried products from the six locations. The fried products need to be protected from contaminations/infestations by flies and other microbial organisms through provision of cover at all times to ensure microbe free products.

Keywords: Frying, Proximate composition, Sensory evaluation, Bacteria and Infestation.

1. Introduction

Fish is one of the most valuable sources of food worldwide. People obtain about 20% of their animal protein from fin fish and shell fish. FAO [1] reported that about 35% of all fish is eaten fresh, chilled or frozen. Fish and marine products are used as medicine, ground into vitamins or processed into cosmetics and perfumes, lubricants, varnishes soap and margarine. Omega-3 fatty acids are very important for normal growth particularly for the blood vessels and nerves and keeping our skin and other tissues youthful. Research studies have revealed that in population that consume large quantities of fish, with a high utilization of omega 3s, there is reduced risk of heart diseases [2].

The world’s fish population from capture fisheries and aquaculture reached 121 millions tones in 1996. The figure is 3.7 million tones more than in 1995. A breakdown shows that 72 percent of the total fish production comes from marine catches, 9 percent from aquaculture [3]. In developing countries like Nigeria, artisanal fishermen supply most of the fish used for direct human consumption and provide a large number of people with relatively low-cost of nutritious food. In many cases, they are responsible for between 50 to 70 percent of the nations catch.

In Nigeria, fish alone contributes on the average 20-25% per caput animal intake and could be as high as 80% in coastal and riverine communities. FAO [4] estimated the projected population and fish demand and supply from 1997 to 2025, with domestic fish population by the year 2007 as 0.77 million tones.

A decline in fish availability will have a detrimental effect on the nutritional status of the citizenry in places where fish contributes significantly to the protein intake of the people [1]. Fish losses arising from bacteria and autolytic spoilage are enormous. Ibru [5] analyzed and enumerated some of the problems as inadequate modern inputs for fishing, poor and most often non-existing access roads and other means of communication between key production areas and marking as well as administrative centres, others are lack of processing, storage, distribution and marketing. A global study published in nature concludes that 90% of all large fishes have disappeared from world oceans in the past half century, the devastating result of industrial fishing [6].

The main objective of this study was to determine the quality of the fried fish products sold...
at strategic locations in Sokoto metropolis through analysis of
the proximate composition of the fried products, analysis of
bacteria load and conduct sensory evaluation through sensory
assessment of the products.

2. Materials and Methods

2.1 Description of the Study Area
Sokoto state is located to the extreme North western part of
Nigeria between longitude 4°E and 6°54'E and latitude 12N and
13°58N. It shares common borders with Niger republic to the
North, Kebbi state to the southwest and Zamfara to the East.
The total land area is about 32,000 km², while the total
population in 1999 is 2,809,156 [7].

2.2 Sample collection and Treatment
Fried fish samples were purchased from the different processing
locations already identified in the Sokoto metropolis, the
experiment was set to cover a period of six weeks. On weekly
basis, samples were procured from the processors and were
brought to the central laboratory, Faculty of Agriculture,
Usman Danfodiyo University for analysis. The sampling
stations were as follows: Arkilla-Wamakko Junction, Dandima
Junction, Kwalkwalawa, Sokoto Central Market, Sokoto Old
Market, and Tashar Illela. The samples were taken to the
laboratory for proximate analysis, bacteriological analysis and
sensory evaluation.

2.3 Proximate composition
Moisture was determined by oven drying the samples of fried
fish products obtained from the six sampling locations at 105 °C
for 24 hours. Crude protein was determined by the Micro-
kjeldahl methods as described by AOAC [8].

2.4 Bacteriological Test
Bacteriological analysis was conducted in triplicate using the
standard plate count. One gram of the fried products for each of
the six centres was diluted into 9mls of distilled water (1 g: 9
mls) in sterilized universal tubes [9].

2.5 Sensory evaluation
2.5.1 Taste Panelist
Ten taste panels were selected from student of the Department
of forestry and fisheries for the sensory evaluation of the
purchased products. The taste panelists were all efficient in
sensing odour, smell and feeling. Efforts were made to ensure
that they are non-smokers.
Every week, samples were brought to the tasting room in
special plates to allow the panelists taste and record their
observations based on the hedonic scale provided below

<table>
<thead>
<tr>
<th>Taste Level</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely acceptable</td>
<td>6</td>
</tr>
<tr>
<td>Very acceptable</td>
<td>5</td>
</tr>
<tr>
<td>Slightly acceptable</td>
<td>4</td>
</tr>
<tr>
<td>Slightly unacceptable</td>
<td>3</td>
</tr>
<tr>
<td>Very unacceptable</td>
<td>2</td>
</tr>
<tr>
<td>Extremely unacceptable</td>
<td>1</td>
</tr>
</tbody>
</table>

2.6 Statistical analysis
The data obtained were analysed on the level of biochemical
and sensory evaluation of fried fish. Analysis of variance was
employed, using statistical package for social statistics (SPSS)
computer package and descriptive statistics was also employed,
mean, standard deviation, LSD difference were also determined.

3. Results
Table 1 shows the average composition of the fried products
from the six sampling locations. The overall moisture ranged
from 48.17% to 51.33% in the fried products purchased from
Sokoto central market and Dandima respectively .The crude
protein were significantly different (P<0.05) between some of
the sampling locations.

Table 2 shows the results of the total viable count of bacteria
from six sampling locations. The mean counts were ranged 5 to
63, respectively. Sokoto central market had the highest and
kwalkwalawa had the least.
Table 3 predicts the results of the taste panels scores of fried
products purchased from the six sampling locations. The results
indicated that samples from Arkilla had the highest score in
terms of texture and flavor during week 3 while the least score
(1.0±0.89) was obtained in the flavor of samples from Sokoto
Old Market during the 5th week of sampling.

### Table 1: Average proximate composition of fried fish samples from six locations.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Parameters</th>
<th>Moisture</th>
<th>Crude Protein</th>
<th>Lipid</th>
<th>Ash</th>
<th>NFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkilla</td>
<td></td>
<td>43.33±0.58</td>
<td>18.55±1.17</td>
<td>6.38±0.24</td>
<td>9.22±0.51</td>
<td>16.93±1.54</td>
</tr>
<tr>
<td>Dandima</td>
<td></td>
<td>51.33±0.67</td>
<td>17.38±1.16</td>
<td>5.72±0.24</td>
<td>9.56±0.36</td>
<td>15.53±1.33</td>
</tr>
<tr>
<td>Kwalkwalawa</td>
<td></td>
<td>49.0±0.67</td>
<td>21.09±1.18</td>
<td>6.28±0.15</td>
<td>10.32±0.42</td>
<td>14.01±1.69</td>
</tr>
<tr>
<td>Sokoto Central Market</td>
<td></td>
<td>48.17±0.58</td>
<td>21.39±1.16</td>
<td>6.03±0.22</td>
<td>9.56±0.24</td>
<td>14.78±1.43</td>
</tr>
<tr>
<td>Sokoto Old Market</td>
<td></td>
<td>50.50±0.58</td>
<td>17.40±1.21</td>
<td>5.49±0.76</td>
<td>9.38±0.26</td>
<td>14.49±0.7</td>
</tr>
<tr>
<td>Tashar Illela</td>
<td></td>
<td>50.67±0.56</td>
<td>17.22±1.13</td>
<td>6.36±0.34</td>
<td>9.8±0.62</td>
<td>15.74±1.33</td>
</tr>
</tbody>
</table>

### Table 2: Mean weekly bacterial count of the fried products in 10⁵ dilution

<table>
<thead>
<tr>
<th>WK</th>
<th>Location</th>
<th>Mean Count (CFU/g)</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arkilla</td>
<td>50</td>
<td>5.0 x 10⁵</td>
</tr>
<tr>
<td></td>
<td>Dandima</td>
<td>28</td>
<td>2.8 x 10⁵</td>
</tr>
<tr>
<td></td>
<td>Kwalkwalawa</td>
<td>21</td>
<td>2.1 x 10⁵</td>
</tr>
<tr>
<td></td>
<td>Sokoto Central Market</td>
<td>63</td>
<td>6.3 x 10⁵</td>
</tr>
<tr>
<td></td>
<td>Sokoto Old Market</td>
<td>35</td>
<td>3.5 x 10⁵</td>
</tr>
<tr>
<td></td>
<td>Tashar Illela</td>
<td>44</td>
<td>4.4 x 10⁵</td>
</tr>
<tr>
<td>WK</td>
<td>Location</td>
<td>Odour</td>
<td>Flavour</td>
</tr>
<tr>
<td>----</td>
<td>------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>1</td>
<td>Arkilla</td>
<td>3.0±0.78</td>
<td>2.0±0.60</td>
</tr>
<tr>
<td></td>
<td>Dandima</td>
<td>3.1±0.54</td>
<td>3.2±0.82</td>
</tr>
<tr>
<td></td>
<td>Kwankwalawa</td>
<td>2.0±0.89</td>
<td>3.6±1.11</td>
</tr>
<tr>
<td></td>
<td>Sokoto Central Market</td>
<td>3.9±1.81</td>
<td>2.0±0.97</td>
</tr>
<tr>
<td></td>
<td>Sokoto Old Market</td>
<td>2.5±0.92</td>
<td>2.5±0.84</td>
</tr>
<tr>
<td></td>
<td>Tashar Illela</td>
<td>2.2±0.86</td>
<td>4.2±1.66</td>
</tr>
<tr>
<td>2</td>
<td>Arkilla</td>
<td>4.0±1.39</td>
<td>2.0±0.63</td>
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<tr>
<td></td>
<td>Dandima</td>
<td>3.5±1.26</td>
<td>3.5±0.84</td>
</tr>
<tr>
<td></td>
<td>Kwankwalawa</td>
<td>2.7±0.94</td>
<td>2.5±1.91</td>
</tr>
<tr>
<td></td>
<td>Sokoto Central Market</td>
<td>3.6±1.27</td>
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<td>2.5±0.86</td>
<td>2.8±0.99</td>
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<tr>
<td>3</td>
<td>Arkilla</td>
<td>3.4±0.19</td>
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<td>2.5±0.92</td>
<td>2.3±0.96</td>
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<tr>
<td></td>
<td>Kwankwalawa</td>
<td>4.6±1.2</td>
<td>2.0±0.77</td>
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<tr>
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<td>Sokoto Central Market</td>
<td>2.8±0.77</td>
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<td>Tashar Illela</td>
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<td>4.0±1.78</td>
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<td>4</td>
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<td>5</td>
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<td>Dandima</td>
<td>2.5±0.91</td>
<td>2.3±0.91</td>
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<tr>
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<td>Kwankwalawa</td>
<td>3.1±1.04</td>
<td>3.6±1.69</td>
</tr>
<tr>
<td></td>
<td>Sokoto Central Market</td>
<td>1.4±1.13</td>
<td>2.8±0.75</td>
</tr>
</tbody>
</table>
4. Discussion
The proximate composition, bacteriological assessment and sensory evaluation of fried fish sold within Sokoto metropolis were studied. The variation in moisture content was due to the temperature of the oil used in frying. The percentage of moisture content was higher than the percentage recorded by Eyo [3]. Drying and frying of fish removed moisture content making it unavailable for the spoilage activities of bacteria. The protein content of each of the fried products differed significantly (P<0.05). This variation may be due to the fact that moisture removed made the protein be more concentrated. Similarly, the percentage protein content in the fish products exceeded the limit of Magawata and Obafemi [10] and Stansby [11] on fish fillet. The protein content of the fried products was not of the same quality because of the differences in the quality of protein in each of the products. Frying dehydrates the fish flesh and kills many of the bacteria in the fish [12]. The presence of moisture in fried fish permits the growth of bacteria and mould in fish flesh during storage [9]. Samples from Sokoto central market had the highest number of bacteria due to the presence of dust, drainage and too much heat. Kwankwala had the least number of bacteria because they normally open in the evening and microbial activity is normally low when there is decrease in temperature i.e. the environment is not favourable for bacterial growth. The sensory quality of the products were observed to be fluctuating throughout the experimental period and there was significant difference P<0.05 in the products. The less acceptability was found in Arkilla. This implies that the fresh products must have been bought when rancidity has set in. Magawata and Shina [11] reported similar trend in the dried Clarias gariepinus.

5. Conclusion
The fried products in all the six sampling locations were found to be nutritionally good throughout the six weeks of the experiment. Crude protein and moisture were found to be significantly different and within the values observed by many authors. The bacterial load fluctuated during the study period but all values were within the acceptable ranges. Due to mishandling of the fried products in all the sampling locations the following recommendations are hereby forwarded to ensure good quality products for consumers; the fried products need to be covered with hygienic material at all the times. Packaging of the products in special containers will ensure microbe free products and containers used in drying should always be a good sanitary.

6. Acknowledgement
The authors acknowledged the Department of Fisheries and Aquaculture, Usmanu Danfodiyo University, Sokoto, Nigeria for supporting the research and particularly the staff of the central laboratory for analyzing the samples.

7. References
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