Sensory and Microbial Evaluation of the Quality of (*Oreochromis* spp, *Bagrus* spp and *Claris* spp) Fish

Batool Altahir Mohieldin Altahir¹, Haram Hassan Abbas Bakhiet²*

¹Department of Fisheries and Wildlife Science, College of Animal Production Science and Technology, Sudan University of Science and Technology P.O. Box 204, Khartoum North, Sudan.

²Ministry of Animal Resources –Nyla Sudan.

*Corresponding Author: Haram Hassan Abbas Bakhiet

Abstract

This study was conducted during (Nov. 2016) to evaluate the quality of fresh fish *Oreochromis* sp, *Bagrus* sp, *Clarias* sp at Almawrada fish market based on sensory and microbial testing. Sensory examination using the European scheme, one hundred sixty five samples were collected, fifty five samples from each species, drawn from ten tons and total of thirty swabs samples were obtained ten samples from each species for microbial analysis. The results showed that there was highly significant difference in sensory evaluation between fresh fish *Oreochromis* sp, *Bagrus* sp, *Clarias* sp. As the average skin of fish respectively (1.5±7 , 1.8±.9 , 2.9±.9) and outer slime (1.5±8 , 2.2±1, 2.9±1) and eyes (1.8±.8 , 2.3±.9, 2.9±.9) and gill color (1±.7 , 2±.7 , 3±.7) peritoneum (1.7±.1 , 2.1±.9, 2.9±.9) and gill odour (1.1±.7 , 2±.1, 2.9±.7) of the *Clarias* spis the beast quality, and the total number of bacterial load for fresh fish *Oreochromis* sp, *Bagrus* sp, *Clarias* sp respectively were 5.9×10⁵±.18×10⁵ c.f.u/g, 4.05×10⁵±.31×10⁵ c.f.u/g, 4×10⁵±.47×10⁵ c.f.u. Result indicates no significant difference in total bacterial count from the studied ssp. However the salmonella and E. coli were isolated as Pathogenic bacteria. The unsuitable condition in Almawrada Fish Market should draw attention of the public authority consider all this deviation which no doubt well affect the environment and human health.

Keywords: Fish, Odour, Clarias, Processing.

Introduction

Fish is one of the most important foods and is valued for its nutritional qualities fish protein is a good source of high quality protein containing essential amino acids in the amount and proportion required for good nutrition it also provides a good source of vitamins and minerals it will also enhance the proper mental and immunity development against disease among growing children [1].

Fish is an indispensable source of micronutrients, such as iron, iodine, zinc, vitamin A and B the quality of fish and fishery products has become a major concern in fish industry all over the world fish, being one of the exceptionally perishable foods and as a result of globalization of food trade fish products tend to be more susceptible to rejection due to poor quality especially if the initial raw materials are of poor quality despite the technological developments in fish production [2]. Sensory evaluation is defined as the scientific discipline used to evoke, measure, analyze and interpret reactions to characteristics of food as perceived through the senses of sight, smell, taste, touch and hearing most sensory characteristics can only be measured meaningfully by humans.

However, advances are being made in the development of instruments that can measure individual quality changes in sensory analysis appearance, odour, flavour and texture are evaluated using the human senses scientifically, and the process can be divided into three steps. Detection of a stimulus by the human sense organs; evaluation and interpretation by mental process [2]. The major changes in fish freshness for instance unattractive change in food characteristics such as, flavours and odours and colour are largely due to bacterial growth and activity).
Microbiological methods are used to estimate bacterial numbers, in order to determine fish freshness, hygiene and or evaluate the possible presence of bacteria or organisms of public health importance microbiological prediction estimation of bacterial numbers therefore, in order to serve the purpose of food safety and shelf life determination, is expected to relate quantitatively to the characteristics of the food during storage [3].

**Aim of the Study**

The main objective of this research to draw attention to the status of fish quality at almawarada fish market Khartoum –Sudan.

**Specific Objectives**

- To determine the quality of the fish spices Tilapia sp, Cat fish, sp Bagrus us sp using sensory evaluation skin, outer slime, eye, gill, peritoneum, gill and internal ordure by EU (European Scheme).
- To determine total bacterial load and isolate the pathological bacteria (Ecoli-Salmonila) from studied fish spp.

**Materials and Methods**

**Fish Sampling**

One hundred sixty five sample were collected from Almawrada Fish Market to evaluate the fish quality and level of freshness of the fish species Oreochromis sp, Bagrus sp, Clarias sp these sample were drawn from ten ton inspected and rated according to European scheme and total of thirty swabs samples were obtained from skin and gill ten sample from each species Preserved in ice and transferred to microbiology laboratory.

**Microbial Analysis**

**Materials**

Flask, test tub ,swab ,distle water ,petry dish, cotton, loops, tips, out oclave Oven, incubation ,injection, sensitive balance, pepatte ,broth agar ,nutrient agar, DCA agar , EMB agar.

**Preparation of Serial Dilutions**

Separate sterile pipettes were used, decimal dilution of 10-2, 10-3, 10-4, 10-5 and others were prepared, and sample was homogenized by transferring 1ml of previous dilutions to 9ml of diluents. Samples foam avoided, all dilution were sacked 25 times within 7 seconds. 1ml of each dilution was pipeted into separate duplicate, appropriately marked Petri dishes. Two plates were inoculated per dilution 15-20 ml plate count agars were added (after cooled to 45º ±1) to each plate within 15 min. of original dilution [4].

**Total Viable Count (TVC)**

The test was done according to. Immediately sample dilutions and agar medium were mixed thoroughly and uniformly by alternate rotation and back and forth motion of plates on flat level surface. The poured agar let to solidify; the solidified Petri dishes were inverted and incubated promptly for 48 hrs at 37 ºC. Thirty to three hundreds colonies were counted. The total colony count per milliliter was calculated by multiplication of the number of colonies counted by dilution level.

**Salmonella Isolated**

Had taken 1ml from sample by micro pipette, then added to surface of Petri dish contain D.C.A agar incubated overnight at 37 ºC for 24 hours Salmonella Show colonies pale yellow color Then the colonies counted.

**Escherichia Coli Isolated**

Had taken 1ml from sample by micro pipette, then added to surface of Petri dish contain EMB Agar incubated overnight at 37 ºC for 24 hours Escherichia coli Show colonies green color Then the colonies counted. Statistical analysis of data was carried out using SPSS statistical package program one way (ANOVA) followed by LSD.

**Results**

**Table 1**: Shows sensory evaluation of (Oreochromis sp, Bagrus sp, Clarias sp) From Almawrada Fish market to using European scheme

<table>
<thead>
<tr>
<th>Fish Spp</th>
<th>Skin M±SD</th>
<th>Outer Slime M±SD</th>
<th>Eyes M±SD</th>
<th>Gill Color M±SD</th>
<th>Peritoneum M±SD</th>
<th>GillOdour M±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oreochromis sp</td>
<td>1.5±.7b</td>
<td>1.5±.8b</td>
<td>1.8±.8c</td>
<td>1±.7c</td>
<td>1.7±.1c</td>
<td>1.1±.7c</td>
</tr>
<tr>
<td>Bagrus sp</td>
<td>1.8±.9b</td>
<td>2.2±1b</td>
<td>2.3±.9b</td>
<td>2±.7b</td>
<td>2.1±.9b</td>
<td>2±1b</td>
</tr>
<tr>
<td>Clarias sp</td>
<td>2.9±.9b</td>
<td>2.9±1b</td>
<td>2.9±.9b</td>
<td>3±.7b</td>
<td>2.9±.9b</td>
<td>2.9±.7b</td>
</tr>
<tr>
<td>Significant</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

M=mean, SD=stander deviation, **= highly significant difference, a, b ,c, =in the same column bearing the different superscripts are significantly different (p>0.01) .
Table 2: Shows microbial load of Orechromis sp, Bagrus sp, Clarias sp from Almawrada fish market

<table>
<thead>
<tr>
<th>Fish sp</th>
<th>No.S</th>
<th>M±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orechromis sp</td>
<td>10</td>
<td>5.9 × 10^2±18×10^0 c.f.u/g</td>
</tr>
<tr>
<td>Bagrus sp</td>
<td>10</td>
<td>4.05×10^2±31×10^0 c.f.u/g</td>
</tr>
<tr>
<td>Clarias sp</td>
<td>10</td>
<td>4×10^2±47×10^0 c.f.u/g</td>
</tr>
</tbody>
</table>

NS= no significant difference (p<0.01)

Table 3: Shows the pathological bacteria Ecoli isolated from Almawrada fish market studied fish spp Orechromis sp, Bagrus sp, Clarias sp

<table>
<thead>
<tr>
<th>Fish sp</th>
<th>No.S</th>
<th>Ve+</th>
<th>Ve-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orechromis sp</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Bagrus sp</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Clarias sp</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

NS= no significant difference (p<0.01)

Table 4: Shows the pathological bacteria Salmonilla isolated from studied fish spp Orechromis sp, Bagrus sp, Clarias sp at Almawrada fish market

<table>
<thead>
<tr>
<th>Fish sp</th>
<th>No.S</th>
<th>Ve+</th>
<th>Ve-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orechromis sp</td>
<td>10</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Bagrus sp</td>
<td>10</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Clarias sp</td>
<td>10</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>

NS= no significant difference (p<0.01)

**Discussion**

The sensory evaluation is the most important method today for freshness evaluation in the fish sector. EU scheme has been used by many research laboratories and in now being implemented in the fish industry. The main advantage is that it is specific for each species and the fluctuation between assessors is diminished. This result is same side with[5] the result found that there was highly significant difference in sensory evaluation between fresh fish Orechromis sp, Bagrus sp, Clarias sp the mean skin of fish at respectively (2.5±8, 3±9, 4±91) and outer slime (2.6±7, 3.5±8, 4.6±9) and eyes (2.8±5.3, 3.3±6, 4.5±7.9) and gill color (2.68±7.6, 3±7, 4±8).

Microbiological tests is to enumerate and characterize the micro-organisms most important in fish and fishery products by looking at the factors that affect their growth and survival and where they are mostly likely found in the processing plant.

Bacterial growth is the main cause of fish spoilage; therefore it is logical to use bacterial number as an index of fish quality. In this study, the total number of bacterial load for fresh fish Orechromis sp, Bagrus sp, Clarias sp respectively 5.9×10^2±18×10^0 c.f.u/g, 4.05×10^2±31×10^0 c.f.u/g, 4×10^2±47×10^0 c.f.u/g .

And this number was in the accepted limit mentioned by SSMO (Sudanese Standards and Metrology Organization, SDS357) which was 5×10^5 to 5×10^6 cfu/g for fresh fish products. In addition, this number was in the normal range stated by [6] which was 10^2 to 10^7 cfu/g of fish meat. This is accepted limit compared to [7] who said that the total mesospheric aerobic bacterial counts over 10^6 c.f.u/g was regarded as accepted limit for sea foods. [8] Reported that the bacterial flora on freshly caught fish depends on environment rather than fish species, and this reflects the wide range of bacterial count.

Also fish spoil at very different rates, and differences in surface properties of fish have been proposed to explain this. Skins of fish have very different textures. Thus, Tilapia sp may have a very fragile integument spoil rapidly compared to Bagrus sp and Cat fish that has a very robust dermis and epidermis. Furthermore, the latter group has a very thick slime layer, which includes several antibacterial components, such as antibodies, complement and bacteriolytic enzymes.

This finding may coincides to some extent with result of [9] who claimed that Although, very wide variations occur, tropical fish species often have prolonged shelf lives when stored in ice when comparisons are made, data on fatty fish like herring and mackerel.
The result indicates the salmonella and E. coli were isolated as contaminant Pathogenic bacteria. Bacteria associated with fish and fishery product can be categorized into two general groups: (1) bacteria (indigenous bacteria) that belong to the natural micro flora of fish (Clostridium botulinum, pathogenic Vibrio spp., Aeromonas hydrophilic); (2) enteric bacteria (no indigenous bacteria) that are present due to fecal contamination (Salmonella spp., Shigella spp., pathogenic Escherichia coli, Staphylococcus aureus) [10].

In polluted waters, high numbers of Enterobacteriaceae may be found. In clean temperate waters, these organisms disappear rapidly, but it has been shown that Escherichia coli and Salmonella can survive for very long periods in tropical waters and once introduced May almost become indigenous to the environment [11] . Each area including amount and type of different available nutrients, pH and nature of adhesion factors for each bacterial groups in the epithelial cells. Control of enter pathogenic E. coli and other food borne pathogens such as Salmonella and Staphylococcus aureus could be achieved.

Precaution should include adequate cooking and avoidance of recontamination of cooked meat by contaminated equipment, water or infected food handlers. This result is agree with [12] studied contaminant bacteria on Orechromis sp Clarias sp at Elmourda fish market. They found that the results of the bacterial count in fresh fish in Tilapia sp Cat fish sp. is 4.69×10^5±1.35×10^5 and 3.69×10^5±0.89×10^5. In addition, the result indicates that Salmonella and E. coli were isolated as contaminant bacteria, while Staphylococcus was not isolated from both fresh Tilapia sp Cat fish sp.

References


Available online at: http://ijaas.kibanresearchpublications.com/index.php/IIAAS