Quality Evaluation of Aqua Cultured Oreochromis Niloticus Fish Recovered from Motile Aeromonas Septicaemia Disease

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Abstract: Motile aeromonas septicaemia disease (MAS) which caused by Aeromonas hydrophila has been reported to cause serious epizootics with extensive losses in wild and cultured fish so, this study was planned to investigate the effect of motile aeromonas septicaemia disease on the quality parameters of the recovered fishes and if there is any human hazards from eating of such recovered fish. Forty Oreochromis niloticus fish of about 200 – 250 gm 20 healthy (control) and 20 recovered from motile aeromonas septicemia disease were collected from fish culture and transported to the laboratory with minimum of delay in an ice box. All fish were apparently healthy, free from any clinical abnormalities indicating bacterial diseases. Organolytic, bacteriological and chemical examination to estimate the freshness rating and the quality parameters were carried out directly after fish arrival to the laboratory. The mean demerit scores of healthy (control) “Oreochromis niloticus” fish group and recovered fish group were 0.9 ± 0.87 and 2.0 ± 0.82 respectively. The mean aerobic bacterial count of healthy (control) “Oreochromis niloticus” fish group and recovered group were 0.4 X10^2 ± 0.87 X10^2 and 2.05 X10^2 ± 2.46 X10^2 (cell / g) respectively. The fish muscle (flesh) of healthy (control) “Oreochromis niloticus” fish group were free from Aeromonas hydrophila microorganism while, the investigator found the Aeromonas hydrophila microorganism in 10% of the recovered fish group. The mean values of fat content (%); protein content (%); pH ; total volatile bases-nitrogen (TVB-N) content (mg/100g) and K-values (%) of Healthy (control) fish group were 1.42 ± 0.23, 19.02 ± 1.01, 5.48 ± 0.26, 6.3 ± 0.84 and 12.06 ± 2.05 respectively while, that of recovered fish group were 1.19 ± 0.23, 17.27 ± 1.53, 5.61± 0.26, 6.64 ± 1.30 and 13.1 ± 1.77 respectively. The investigator suggested these results due to the influence of the disease on the fish immunity, body constituents and general appearance.

Key words: Oreochromis niloticus fish, Motile aeromonas septicaemia disease, Aeromonas hydrophila

INTRODUCTION

The greatest increase in human population with the parallel shortage of animal protein allover the world directed the attention to fish as rapid and healthy compensatory source of good quality animal protein. Fish oils containing high amount of n-3 polyunsaturated fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) may be responsible for preventing atherosclerosis, aging and certain forms of cancer Carroll[1], Umemura et al[2] and Iso et al[3], beside Long chain PUFA are now considered "conditionally essential" for infant growth and development, Simopoulos[4].

Fish as other vertebrates, are susceptible to a wide range of infectious diseases. The frequency of epizootics is greater among intensive and semi-intensive propagated fish more than wild fish due to predisposing stresses. Stressors, including overcrowding, high temperature, a sudden change of temperature, rough handling, transfer of fish, low dissolved oxygen, poor nutritional status and fungal or parasitic infection, contribute to physiological changes and heighten susceptibility to infection. Bullock et al[5].

Motile Aeromonas Septicaemia disease (MAS) which caused by Aeromonas hydrophila has been reported to cause serious epizootics with extensive losses in wild and cultured fish Wakabayashi et al[6], Amin and Eissa[7], Ahmed[8], Soliman[9], Ahmed et al[10], Eissa et al[11], and Angka et al[12].

Aeromonas hydrophila has been implicated as the causative agent of clinical infections in humans, including foodborne gastroenterities Palumbo[13] septicaemia and peritonitis Janda et al[14].

The objective of this study was planned to investigate the effect of Motile Aeromonas Septicaemia
disease on the quality parameters of the recovered fishes and if there is any human hazards from eating of such recovered fish.

**MATERIALS AND METHODS**

A total number of 40 Oreochromis niloticus fish of about 200 – 250 gm [20 healthy (control) and 20 recovered from Motile Aeromonas Septicaemia disease] were collected from fish culture and transported to the laboratory with minimum of delay in an ice box. All fish were apparently healthy, free from any clinical abnormalities indicating bacterial diseases.

Organolyptic, bacteriological and chemical examination to estimate the freshness rating and the quality parameters were carried out directly after fish arrival to the laboratory.

**Organolyptic examination:** The Quality Index Method (QIM) which developed by Branch and Vail[15] for Freshness Quality Assurance System for round fish and 10-point scale for quantitative evaluation of quality of fish and fishery products Lima dos Santos et al[16] has been used.

**Bacteriological examinations:**

Preparation of the fish homogenate sample ICMSF (17): The fish fins were removed and the skin was sterilized by alcohol and flamed. The skin was removed and 10g of fish muscle were taken under aseptic conditions into sterile blender jar to which 90ml of sterile peptone water 0.1% were added to provide a dilution of 10⁻¹. The blender was operated for 2 min. Aerobic plate count (APC): ICMSF[17]. Isolation of Aeromonas hydrophila: Shotts and Rimler[18].

**Chemical examinations:**


**RESULTS AND DISCUSSIONS**

In spite of the extensive search by world’s fish research stations for a rapid scientific method which would be suitable for the routine assessment of the degree of spoilage in fish most inspectors still rely largely on appearance, odour. etc. In borderline cases (incipient spoilage), however, chemical determination may be of considerable value Farber and Harold[23].

The presented data in table 1 revealed that the mean demerit scores of healthy (control) Oreochromis niloticus fish group and recovered fish group were 0.9 ± 0.87 and 2.0 ± 0.82 respectively.

We notice from these results that there was an increase in the mean demerit scores of recovered Oreochromis niloticus fish group than that of healthy (control) group. These relatively high results may be due to the influence of the disease on the fish constituents and general appearance.

Fish usually contain the normal bacterial flora from their environment in addition to the contaminates picked up during harvesting and handling of the fish. The natural resistance of a healthy fish keeps them away. Soon after the fish dies, bacteria begin to invade the tissues from the gills through the vascular system or directly from the intestine and skin Shewan[24] and Graham et al[25].

The data given in table (2) pointed out that the mean aerobic bacterial count of healthy (control) Oreochromis niloticus fish group and recovered group were 0.4 X10² ± 0.87 X10² and 2.05 X10² ± 2.46 X10² (cell/g) respectively.

The ICMSF recommended 5 X 10²/g. as being the maximum level of APC for fresh fish. These results cleared that there was an increase (about 5 folds) in the mean aerobic bacterial count of recovered Oreochromis niloticus fish group than that of healthy (control) group. These high results may be due to

<table>
<thead>
<tr>
<th>Demerit scores</th>
<th>Healthy (control)</th>
<th>Recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Mean</td>
<td>0.9 (excellent)</td>
<td>2.0 (excellent)</td>
</tr>
<tr>
<td>St. deviation</td>
<td>0.87</td>
<td>0.82</td>
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<table>
<thead>
<tr>
<th>Aeromonas h. pathogen</th>
<th>Healthy (control)</th>
<th>Recovered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive No.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 1: Organolyptic demerit scores of healthy (control) and recovered Oreochromis niloticus fish.

Table 2: Aerobic plate count (A.P.C) of healthy (control) and recovered Oreochromis niloticus fish muscles.

Table 3: Incidence of isolation of Aeromonas hydrophila from the muscles of healthy (control) and recovered Oreochromis niloticus fish.
the influence of the disease on the fish natural resistance (immunity). Also the results showed in tables 1 and 2 cleared that there was a high correlation between organolytic scores and bacterial counts. Silliker[27] found that the bacterial counts were closely parallel to organolytic rating.

The fish muscle (flesh) of healthy (control) Oreochromis niloticus fish group were free from Aeromonas hydrophila microorganism while, the investigator found the Aeromonas hydrophila microorganism in 10% of the recovered fish group as cleared in table (3). Also there was a bacterial hazard from eating improbably good cooked fish.

The chemical composition of fish varies greatly from one species and one individual to another depending on age, sex, environment and season[28-31].

The presented data in table (4) revealed that the mean values of fat and protein contents (%) of healthy (control) and recovered fish groups were (1.42 ± 0.23 and 19.02 ± 1.01) and (1.19 ± 0.23 and 17.27 ± 1.53) respectively. These results pointed out that there was a decrease in the mean values of fat and protein contents (%) of the recovered fish group than those of healthy (control) group.

The final pH attained after the fish death (ultimate pH) has an important influence on the textural quality, water holding capacity, resistance to growth of microorganisms and colour of meat Hultin[32] and these final pH differs from one species to another and their is also individual variations between the same species Oehlenschlaeger[33]. The nutritional status of the fish and the amount of stress and exercise encountered before death will have a dramatic effect on the levels of stored glycogen and consequently on the ultimate post mortem pH Huss[34].

TVB-N test is of somewhat wider application test for measuring spoilage in fishes and can be used for products not containing trimethylamine (TMA), beside its determination is relatively simple, cheap and rapid Connell[35].

The K-value can be used as a mean of evaluating the freshness of fish and that the average K-value of fish used as good quality is around 20%. Changes in K-value during storage are known to vary depending on the fish species and tissues used. Ehira and Uchiyama[36]. The rate of change of K-value appeared to indicate the real quality of fish and showed significant correlation with storage time and sensory scores and the mean K-value, if prime quality, should be around 20% Lakshmanan and Gopakumar[37] and Gopakumar[38].

Concerning the chemical deteriorative criteria the presented data in table (4) revealed that the mean values of pH, total volatile bases - nitrogen (TVB-N) content (mg/100g) and K-values (%) of healthy (control) fish group were 5.48 ± 0.26; 6.3 ± 0.84 and 12.06 ± 2.05 respectively while, that of recovered fish group were 5.61 ± 0.26; 6.64 ± 1.30 and 13.1 ± 1.77 respectively.

These results cleared that there was an increase in the chemical deteriorative products of the recovered fish group than those of healthy (control) fish group.

The investigator suggested these results due to the influence of the disease on the fish body constituents which may lead to degradation of the fat and protein content which explain the low percentage of both fat and protein content of the recovered fish group.

Consequently, there were an increase the mean values of pH; total volatile bases - nitrogen and K-value of the recovered fish group due to these degradation process.

REFERENCES


Table 4: Chemical parameters of healthy (control) and recovered Oreochromis niloticus fish.

<table>
<thead>
<tr>
<th>Chemical parameters values</th>
<th>Healthy (control)</th>
<th>Recovered</th>
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<tbody>
<tr>
<td>Fat %</td>
<td>Protein %</td>
<td>pH</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.1</td>
<td>17.3</td>
</tr>
<tr>
<td>Maximum</td>
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<td>20.5</td>
</tr>
<tr>
<td>Mean</td>
<td>1.42</td>
<td>19.02</td>
</tr>
<tr>
<td>St. deviation</td>
<td>0.23</td>
<td>1.01</td>
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