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Bankole SO
Department of Science Laboratory Technology, Federal Polytechnic Ile-Oluji, Ondo, Nigeria

Omotosho TP
Department of Science Laboratory Technology, Federal Polytechnic Ile-Oluji, Ondo, Nigeria

Agunde OS
Department of Science Laboratory Technology, Federal Polytechnic Ile-Oluji, Ondo, Nigeria

Odeyemi IA
Department of Science Laboratory Technology, Federal Polytechnic Ile-Oluji, Ondo, Nigeria

Oloyede EO
Biotechnology Centre, Forestry Research Institute of Nigeria, Ibadan, Oyo, Nigeria

Adaaja BO
Forestry Research Institute of Nigeria, Trial Afforestation Research Station, Afaka, Kaduna, Nigeria

Correspondence
Bankole SO
Department of Science Laboratory Technology, Federal Polytechnic Ile-Oluji, Ondo, Nigeria

Comparative Study of the Bacterial Loads in *Clarias geriepinus* Raised in Earthen and Concrete Ponds

Bankole SO, Omotosho TP, Agunde OS, Odeyemi IA, Oloyede EO and Adaaja BO

Abstract
Bacteria diseases are wide spread and can be of particular importance in fish farming, bacteria exist as micro flora in water until certain environmental conditions such as poor water quality occur, which could impose a stress on fish, thereby making them vulnerable to infection, most especially by pathogenic bacteria. This study was carried out to assess and compare the bacteria diversities in *Clarias geriepinus,* raised in both concrete and earthen ponds in Aquatech College of Agriculture and Technology. It also aims at determining their public health significance. This experiment was carried between May-August 2015. Fish samples were collected from both ponds, analysed and identify Bacteria present. Bacteria isolated from the earthen ponds are *Micrococcus luteu, S.aureus, Bacillus cereus, Proteus vulgaris, Streptococcus faecium.* And from the concrete pond are *Micrococcus luteu, S.aureus, Bacillus cereus, Proteus vulgaris.* From the microbiological analysis bacteria load in samples from earthen pond were found higher than that of the concrete pond, but can still be recommended for human consumption because the microbial load was still within the limit of $x10^5$ what specify the standard limit. Therefore, they are acceptable for consumption and also effective proper processing treatment should be employed consumption.

Keywords: Analysis, Ponds, Microbiological, Health

Introduction
Fish and its products are very important to human population all over the world, According to the food and agricultural organization (2002). Most of the world's population (56%) derives at least 20% of its animal protein intake from fish. This because fish is preferred source of much desired animal protein compared to poultry, beef, mutton or pork. This means that there is higher protein assimilation as compared to other animal protein sources, low cholesterol content and one of the safest sources of animal protein, out of 35g of animal protein recommended by food and agriculture (FAO), less than 7g is consumed on the average. As a result, many Nigerians suffer from protein deficiency due to low protein intake. Nigeria has become one of the largest importers of fish in the developing country's high demand for fish, Nigerians must turn to their under-utilized inland water for improved fish production and aquaculture. The major commercially important fishes include *Clarais gariepinus, Heterobranchus bidosalis and, C. Anguillaris.* The knowledge of their tissue composition vary widely, not only from fish of the same species but also within the same fish.

In Nigeria, the Africa catfish is mostly found and cultured in different states in Nigeria, they are cultured in the concrete or earthen tanks. Most farmers operate in concrete and earthen tanks whose sizes and shapes vary from location to depending on individual taste availability of space and financial resources FAO asserted that fish contributes about 60% of the world supply of protein and that 60% of the developing world derives more than 30% of their animal protein from fish. Fish allows for protein improved nutrition in that it has a high biological value in term of high protein retention in the body, low cholesterol level and presence of essential amino acids. Fish are generally regarded as safe, nutritious and beneficial aquaculture products have sometimes been associated with certain food safety issues. Several studies have demonstrated many bacteria species encountered in different fish which are potentially pathogenic under certain conditions as reported for *Pseudomonas angulluseptica, Streptococcus* sp.

However, there is dearth of information on the bacterial load in African catfish sampled from ponds and natural water. It was also observed that freshwater fish represent an important

source of animal protein to human nutrition.

However, the challenge due to pathogenic organisms especially bacteria has limited its effective production and availability. Diseases occurrence in aquatic animal production is beginning to show a significant impact on yield (Hudson, 1990) [3] in a situation where there is low stocking densities, with low management practice characterized by traditional captured fisheries or extensively managed cultured system, there was low yield levels. In effect, the rate of diseases occurrence was low. Also, the wild population may result not only in the loss of resources but also decrease biodiversity and a shiff in the ecological balance. The good knowledge of fish diseases agent is needed to prevent cure or minimize those negative effect.

Moreover, of all fish diseases, bacterial diseases are wide spread, and can be a serious concern in fish farming. This has been responsible for heavy mortality in both wild and cultured fish (Hudson, 1990) [3]. Disease caused by bacteria are often chronic than acute induced by environmental stress.

Pathogens living in the fish depend on the type and abundance of microorganism present in the water in which they live. Bacteria discovered from the skin may be transient rather than resident on the gill surface. Microfloral of fish intestine often appeared to vary with complexity of fish digestive system.

However, some of these microorganism are not pathogenic, but those that are pathogenic can cause damage to fish such as *aeromonas salmonellosis* which causes furunculosis of salmonids, carperythrodarmayitis and gold fish ulcer diseases; and man when consumed infected fish for instance, cholera caused by *vibrio cholera, salmonellosis*, caused by shigella dysentarie and shigella sonnel: tuberculosis caused by mycobacterium tuberculosis and dysentery caused by Echerichia coli.

2.0 Materials and Methods

Experiment site

The experiment was carried out in Aquatech college of Agriculture Technology, Ibadan.

These ponds were constructed in 2003 and are completely dependent upon ground water. Limited vegetation exists in the hallow shore area and there is mud of 14 to 22 cm on the bottom. Water was regularly added to compensate for evaporation and seepage. Inorganic fertilizers were applied and Africa catfish *C. Gariepinus* from Aquatech college of Agriculture and technology Fish farm were stocked and fed with pelleted feed (34% crude protein, 4% fat, 3% crude fiber, 8% moisture content).

Fish Samples

Twelve (two in each group) were chosen randomly from each pond at each sample for bacterial counts. None of the fish sampled had gross lesions and all were assumed to be clinically normal.

2.1 Method

Skin Surface

A sterilised rectangular wire swab guide measuring 5cm by 2cm was placed on the lateral surface of the fish sample. A sterile cotton wool swab was dipped in 0.10% sterile peptone water and was robbed over the surface of the fish on the area covered by the wire swab guide. The swab was immediately placed in a sterile sample bottle containing 100mls of 0.10% (w/v) peptone water.

2.2 Preparation of Media

Nutrient Agar (NA) – Total viable count

28g of powdered commercially nutrient agar was weighed on analytical metller balance into a clean dry 1 litre conical flask and 100mls of distilled water placed inside a water bath set about 900c, allow the agar to dissolve. Distribute them into MacCantney bottles and placed them inside autoclave and set the autoclave at 121 ^{0}C for 15mins.

Potato Dextrose Agar (PDA) 39g of PDA was weighed into a liter capacity of colonical flask to boil and distributed them into McCartney bottles and placed them inside an autoclave as for Nutrient Agar.

Macconkey Agar (MCCA)-Coliform count 55g of MacConkey Agar was weighed into a litre capacity of colonical flask and bring to boil to dissolve the agar. Distributed them into MacCartney bottles and autoclaves as Nutrient Agar.

2.3 Microbiological Analysis

The fish samples were scrubbed, rinsed with water, surface sterilized (70% ethanol) and edible portion of the fish were aseptically extracted as described by American Public Health Association (APHA). The sample was homogenized and about 10g was taken for microbiological analysis. Standard pour plates were prepared from 10-fold dilutions into nutrient agar medium for total heterotrophic bacteria counts, MacConkey agar for total coliform counts and dextrose agar for total fungal counts. The bacterial plates were incubated at 37^{0}C for 24-48 hours, while fungal plates were incubated at room temperature (28±2^{0}C) for 3-5 days. Colonies were selected randomly and were characterized using morphological and biochemical test such as gram stain, spore stain, motility, catalase, oxidize, coagulase, indole, MR-VP and Urease and sugar fermentation tests. Bacterial isolates were identified with reference to Cowan and Steel's Manual for the identification of Medical Bacteria and Bergery's Manual of Determinative Bacteriology. Fungal isolates were identified based on their morphological and cultural characteristics as recommended.

3.0 Results and Discussion.

Table 1: Results Showing Microbial Loads on Catfish Samples Raised In Earthen And Concrete Ponds**.**

Samples	Total Bacteria Count	Total Coliform Count	Total Fungi
Earthen Pond	I	II	
Sample A	1.2 x 10^5	0.8 x 10^5	NG
Sample B	1.6 x 10^5	0.6 x 10^5	NG
Concrete			
Sample A	1.4 x 10^3	0.5 x 10^3	NG
Sample B	1.2 x 10^3	0.3 x 10^3	NG

Table 2: Result Showing Bacteria Isolated From Catfish Raised In Both Concrete And Earthen Ponds.

Samples	**Bacteria Isolated**
Earthen Pond	
Sample A	*Micrococcus varians, Micrococcus luteus, S. Aureus, Bacillus cereus, Proteus vugalris*
Sample B	*Micrococcus luteus, S. Aureus, Proteus vulgaris, Streptococcus faecium*

Samples	Bacteria Isolated
Concrete Pond	
Sample A	*Micrococcus luteus, S. Aureus, Bacillus cereus, Proteus vugalris*
Sample B	*S. Aureus, Proteus vulgaris,*

The microbial load in the catfish (*Clarias geripinus*) samples from the earthen and concrete pond as shown in table 1: in the earthen pond the total bacteria count ranges from 1.1 x 10^5 to 1.6 x 10^5 while in the concrete pond the bacteria count range from 1.2 x 10^3 – 1.4 x 10^3.

For the total coliform count in the earthen it ranges from 0.6 x 10^5 – 0.8 x 10^5 while in the concrete pond it range from 0.4 x 10^5 – 0.5 x 10^3. In the table above there is no fungal growth observed in the fish samples from both ponds.

From the table 2; the microorganism isolated are *Micrococcus varians, Micrococcus luteus, Staphylococcus aureus, Bacillus cereus, Proteus vulgaris, Streptococcus faecium*. The table 2; shows different microorganism isolated from all fish samples. From the result above, it shows that many pathogenic bacteria were isolated. The skin of these catfish contained more of the bacterial due to their constant contact with the water. The presence of *Bacillus cereus* bacteria isolated causes toxin medicated diseases rather than an infection. According to ICMF (1986) and fish that have more than x10^6 bacteria count in one gram is not suitable for consumption. But since gut and gill are always being removed and discarded, there is a tendency for safety, but the people should be encouraged not to consume them (gut and gills). Nevertheless, it is advisable (especially for those sample from earthen pond) that good effective processing treatment be employed such as washing, removal of gill and gut. This will help to reduce the microbial loads on the flesh and muscle thereby keeping the fish safe for human consumption.

According to the report by, pathogens living in fish depend on the type and abundance of microbiological assessment of fish coupled with pathogenic test. The implication of bacteria is within the limit which part of it is pathogenic that may eventually lead to fish diseases or death.

Good hygienic practices should be carried out when fish from earthen are purchased for consumption. Bacteria in fish not properly cooked cold be transferred to man as they establish themselves in the intestine particularly those that are pathogenic, leading to bacterial infections of various kinds. The good cultural and management practice in the departmental ponds should be sustained and improved upon for higher productivity.

4.0 Conclusion and Recommendation.

This study confirms the existence of the pathogenic bacteria in the catfish (*Clarias geripinus*) analyzed which are of public health significance. While the bacteria load recorded from the both ponds are still acceptable, being found within the acceptable limit of human consumption.

Moreover, bacteria isolated from the fish samples are a function of bacteria found in the ponds which is influenced by agricultural waste that are used to feed the fish. Findings have confirmed that fish can be infected with variety of microbial species especially bacteria, which is a function of bacteria found in their habitat.

Furthermore, measures should be put in place in raising catfish fish that could possibly reduce or eradicate potential microorganism associated with fish. Due to the high level of consumption of the (*Clarias geripinus*) fish. There is need to intimate fish consumers of the health risk associated with improper cooking and handling of fish. Fish should be properly processed before consumption in order to prevent bacterial in the fish that may infect man if consumed.

The used of dead chicken part should be discouraged because the cause of the mortality could be as a result of microbial infection.

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