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Bacteriological Quality of Street Vended Smoked Blue Whiting (*Micromesistus poutasou*)

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Abstract

Smoked blue whiting (*Micromesistus poutasou)* popularly known as panla was studied to determine its bacteriological quality and safety. Panla as it is popularly called is vended by women and is widely consumed in Baruwa- Ipaja, Lagos State and other such low income densely populated areas in Nigeria. The proximate composition of *M. poutasou* revealed 34.62% protein, 2.32% ash, 60.46% moisture and 2.6% lipid, which shows that the fish is nutritionally high in protein with low–oil content. The bacteriological study was carried out on three sites of sale in Baruwa, on some fish samples, unwashed; washed with cold water; washed with hot water and washed with salt in cold water, respectively. The microbial analysis revealed total plate count from 1.9 x 10^4 to 7.8 x 10^5 Cfu/g from unwashed fish samples ,2.4 x 10^3 to 2.06 x 10^6 Cfu/g from fish washed with cold water, no organism detected from fish washed with hot water and 1.7 x 10^5 to 2.9 x 10^6 Cfu/g from fish washed with salt in cold water, while *Vibrio* spp. was not detected. *Staphylococcus aureus* were detected in site A and B respectively, *Salmonella* spp. and *Escherichia coli* were detected in site B. Observation of smoked *M. poutasou* (panla) showed that the sanitary levels of site A and B were low. Therefore smoking of blue whiting in Baruwa- Ipaja requires more attention from health authorities, educational programs for vendors and improvement of preparation and handling environments.

Key words: *Escherichia coli, Vibrio* spp, vendors, *Staphylococcus aureus*.

Introduction

Seafood has traditionally been a popular part of the diet and main supply of animal protein in many parts of the world. Fish and fishery products constitute an important food component for a large section of world population, more so in developing countries, where fish forms a cheap source of protein. In the last two decades there has been an increase in awareness about the nutritional and health benefits of fish consumption. The low fat content of some fish and the presence of polyunsaturated fatty acids in red meat fishes which are known to reduce the risks of coronary heart diseases, have increased the dietary and health significance of seafood consumption (Din *et al.*, 2004).

The Food and Agriculture Organization (1994) asserted that fish contributes about 60% of the world's supply of protein and that 60% of the developing world derives more than 30% of their annual protein from fish. However, in Nigeria, fish constitute 40% of the animal protein intake (Olatunde, 1998).They are prone to contamination at various stages of handling and processing and the quality is a major concern to food processors and public health authorities (Oramadike et al.,2010).

Blue whiting, M. poutasou popularly called panla is a smoked fish with consistent increase in consumption rate among the low income populace in Western Nigeria and some other parts of the country. M. poutasou (panla) has been recognized as a readily available, inexpensive and nutritious ready-to-eat fish. It is a marine fish, and is got fresh from almost all the fish markets along the Lagos coastal line.

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The popular method of preparation is mainly by salting the fish after washing, arranged on the smoking tray and then smoked in the charred coal fire in their residence.

No information concerning the safety of this type of street-vended smoked-fish is available. Researchers who investigated the microbiological quality of street-vended foods have reported high bacterial counts and a high incidence of food borne pathogens in such foods in different countries (Bryan et al. 1992). The number of people suffering from food borne illness has increased dramatically over the last decade (Altekruse et al.1997). From the standpoint of microbiology, fish and related products are a risky foodstuff group. Particularly, Clostridium botulinum type E and Vibrio parahaemolyticus rank among pathogenic bacteria associated with fish. Other potentially pathogenic bacteria associated with fish and shellfish include C. perfringens, Staphylococcus spp., Salmonella spp., Shigella spp., V. cholerae and other vibrios. Outbreaks usually occur due to the ingestion of insufficiently heat-treated fish or products contaminated after or during their processing. Freezing fish and related products in the seawater, poor handling, long-time transport or cooking in fishing containers straight on the deck contributes to their contamination with microorganisms (Novotny et al., 2009).

Reported information in this study could be used to improve handling and preparation of this nutritious fish and protect its ever-increasing consumers. It can also be a source document for further studies and useful for public education on fish. This study is to determine the bacteriological quality and safety of the smoked M. poutasou (panla) smoked and sold by women in Baruwa-Ipaja, Lagos State, Nigeria.

Materials and Methods

Forty-five samples of smoked *M. poutasou* (panla) were randomly bought from women vendors in three retail outlets in Baruwa, Ipaja Lagos. Sampling was performed weekly over a period of one month. The samples were collected in sterile glass containers and transported to laboratory of the Nigerian Institute for Oceanography and Marine Research Victoria Island Lagos for biochemical and microbiological analysis. The samples were analysed aseptically for total aerobic count, detection of *Escherichia coli*, *Staphylococcus aureus*, *Vibrio* spp., *Salmonella* /*Shigella* spp. and proximate analysis of the fish.

Chemical Analysis. Proximate analyses were carried out in triplicate determination on the samples. This analysis included the following: moisture content, total lipid, crude protein and ash. The moisture content was estimated by drying samples to constant weight at 105 ± 2^0C using the oven dry method (AOAC, 1994). Lipid determination was carried out using the Soxhlet extraction method. The ash content of the fish was determined by igniting the sample at 550^0C for 5-6 hours until the sample was completely free from carbon particles in a carbolite Sheffield LMF3 muffle furnace while the total nitrogen was determined by the Kjeldahl method as described by Vlieg, 1984 and a factor of 6.25 was used for converting the total nitrogen to crude protein content of the fish sample.

Microbiological Analysis. Fish flesh excised were decimally diluted with diluted peptone water (0.1% w/v) and homogenized in a blender for 60 seconds. Serial dilutions in peptone water (0.1% w/v) were made, 0.1 ml inoculum was added to the surface of duplicate plate count agar (SPCA, Oxoid) plates for total bacterial counts, *Escherichia coli* was determined using Eosin Methylene Blue agar, *Salmonella and Shigella* were enumerated using *Salmonella and Shigella* agar (SSA) and thiosulphate citrate bile salt sucrose (TCBS) agar for *Vibrio.*

From each of the samples, 10g was aseptically taken and 10-fold serial dilutions were prepared. Another, 10g was taken and washed in 100 ml tap water and 100 ml of hot water at 100^oC respectively for a 10-fold serial dilution. Also 10g of sample was washed in a solution of 5g of salt in 100ml of tap water. A ten-fold dilution was also prepared.

TABLE 1: PROXIMATE COMPOSITIONAL STUDY OF SMOKED *M. poutasou* (panla)

PARAMETRS	% COMPOSITION
PROTEIN	34.62
ASH	2.32
MOISTURE	60.46
LIPID	2.6

TABLE 2: BACTERIA ISOLATED FROM SMOKED *M. poutasou* (panla) SITE A

PARAMETRS	Not washed	washed with cold water	washed with hot water	washed with salt
TVC (cfu/g)	1.9×10^4	4.5×10^5	-	2.9×10^6
Staph. aureus	+	+	-	+
Vibrio spp.	-	-	-	-
Salmonella spp.	-	-	-	-
E.coli	-	-	-	-

Key: += present, - = Not present , TVC- Total Viable Count.

TABLE 3: BACTERIA ISOLATED FROM SMOKED *M. poutasou* (panla) SITE B

PARAMETRS	Not washed	washed with cold water	washed with hot water	washed with salt
TVC (cfu/g)	7.8×10^5	2.06×10^6	-	1.7×10^5
Staph. aureus	+	-	-	-
Vibrio spp.	-	-	-	-
Salmonella spp.	+	+	-	+
E.coli	+	-	-	-

TABLE 4: BACTERIA ISOLATED FROM SMOKED *M. poutasou* (panla) SITE C

PARAMETRS	Not washed	washed With cold water	washed with hot water	washed with salt
TVC (cfu/g)	3.0×10^4	2.4×10^3	-	-
Staph. aureus	-	-	-	-
Vibrio spp.	-	-	-	-
Salmonella spp.	-	-	-	-
E.coli	-	-	-	-

Results

The proximate compositional study of smoked *M. poutasou* (panla) as shown in table 1. The result shows that the fish contains 34.62% protein, 2.32% ash, 60.46% moisture and 2.6% lipid.

The results of bacteriological analysis of smoked *M. poutasou* (panla) samples from site A, as shown in table 2, revealed a total plate count of 1.9×10^4 Cfu/g from fish that was not washed before serial dilution, fish washed with cold tap water revealed 4.5×10^5 Cfu/g, no organism was isolated from fish washed with hot water while fish washed with 5% salt had 2.9×10^6 Cfu/g. *Staphylococcus aureus* was detected in site A.

Site B, as shown in table 3, revealed a total plate count of 7.8×10^5 Cfu/g from fish that was not washed before serial dilution, fish washed with cold tap water revealed 2.06×10^6 Cfu/g, no organism was isolated from fish washed with hot water, while fish washed with 5% salt had 1.7×10^5 Cfu/g. *Salmonella* spp. and *Escherichia coli* were detected in site B.

Site C, as shown in table 4, revealed a total plate count of 3.0×10^4 Cfu/g from fish that was not washed before serial dilution, fish washed with cold tap water revealed 2.4×10^3 Cfu/g, no organisms were isolated from fish washed with hot water and 5% salt.

Discussion

To The proximate composition of smoked *M. poutasou* (panla) as shown in table 1, revealed that the fish belongs to high protein category because it is within the range of 15-20% and low oil of much less than 5% (0.55 and 0.70%) category. It has higher protein content than the fatty fishes, meats or poultry, and an ideal source of animal protein.

Fishes with lipid content below 5% are lean (Stanby, 1982), hence, *M. poutasou* (panla) is considered as a lean fish. The low lipid content value might be as a result of the environment, specie and the type of diet the fishes feed on.

Moisture content in the fish was within the range as previously reported by (Gallagher *et al.,* 1991). According to FAO, 1999, moisture and lipid contents in fish fillets are inversely related and their sum is approximately 80% with other components accounting for the remaining 20%.

The range for the ash content gave an indication that the fish samples may be good sources of minerals such as calcium, potassium, zinc iron and magnesium.

Street vended foods are important source of nutrients to low income populations groups in developing countries. This emphasizes the necessity of organizing this sector to improve its low hygienic and hazardous situations. However, it was recognized from this study that some vendors prepared and smoked in poor hygiene conditions, the study confirmed that the sanitary level in the sale places are deteriorated, leading to the occurrence of severe public health hazards (Hobbs and Roberts 1993). Seafood could become a source of bacterial pathogen by exposure to contaminated water or through processing practices thus representing a public health hazard (Iwamoto *et al.*, 2010).

As observed in the study, the total viable count was between 2.4 x 10^3 and 2.9 x10^6 as shown in table 2-4, for the unwashed fish samples, washed with cold water and washed with salt. According to ICMSF (1986), the plate count should be less than 10^6 and the borderline limit of acceptability is between 10^6 and less than 10^7. This result is within the acceptable limit.

Staphylococcus aureus was isolated from some fish samples in site A &B as shown in table 1-2. It is not surprising in such poor hygiene and handling situations to isolate *Staphylococcus spp* from the majority of samples, a well-known food-borne pathogen, which rarely has been implicated in cases originating from consumption of smoked sea foods. This bacterium may be contributed through human handling of the raw seafood and products. Nevertheless, adequate precautions can prevent *S .aureus* contamination, growth and enterotoxin production from occurring in smoked fish products (Himelbloom, 2007). Contamination of ready-to-eat products can be prevented through the use of latex gloves to reduce excessive human hand contact (ICMSF 2000). Open-air markets have been implicated in direct transfer of *S. aureus* during handling between traders and customers of ready-to-eat cooked, smoked, dried, or fried fish and shellfish.

Salmonella spp. and *Escherichia coli* were also isolated from smoked-fish from site B as shown in table 2, the presence of *Salmonella* spp. and *E. coli* in seafood reflects secondary contamination, as *E.coli* is known to be associated with the gastrointestinal tract of warm-blooded animals, and not known to be present in the environment as a natural flora. Sewage contamination of fish harvesting areas is the major reason for the presence of *E. coli*, but contamination can occur through the use of non-potable water or ice in the landing centers or fish markets (Kumar *et al*., 2004). The smoked- fish samples that were soaked in boiled water for 30 mins before serial dilution revealed no growth of micro-organisms as shown in tables 2-4, which shows that soaking smoked fish in boiled water for about 30 mins reduces the microbial load. Therefore, it is important that all stages of fish production, handling and processing are monitored for *E. coli* and *Salmonella* spp. contamination.

The women vendors lack good personal hygiene, which is vital in reducing the chance of contamination of foods. It is not surprising in such poor hygiene and handling situation to isolate *Staphylococcus spp* from the majority of samples. To minimize health risks associated with this type of food, it is important to organize the basic food hygiene training for the women vendors of *M. poutasou* (panla) in Baruwa- Ipaja, Lagos Nigeria and also educate the consumers on the soaking of smoked fish for about 30 mins in boiled water before consumption to avoid food poison.

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