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Isolation of Fungi Infesting Smoked African Catfish from Markets in Ibadan, Nigeria

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ABSTRACT
This study reports the fungal load of smoked African catfish (*Clarias gariepinus*) obtained from Dugbe, Aleshinloye, Bodija and Sango markets in Ibadan metropolis. Fungal loads were determined using standard microbiological procedures. The fungi isolated were *Rhizopus, Aspergilus, Fusarium and Penicillium species*. Fish samples from Bodija market had significantly ($p<0.05$) higher fungal load compared with those from other markets under study. This study indicated that smoked catfish sold in the various markets in Ibadan are best for consumption as the microbial load still falls within acceptable limits for human consumption.

Key Words: Isolation, Fungi, Smoked African catfish, Market, Ibadan, Nigeria

INTRODUCTION

Fish is highly nutritious with high protein content. However, it is a suitable medium for growth of micro-organisms, if poorly processed (Oparaku and Mgbenka, 2012). The growth of microorganisms and other non-microbial activities such as lipid oxidation contribute to the deterioration of fish products (Martin, 1994). An increase in the ambient temperature triggers favourable conditions for microorganisms to thrive, which reduces the quality of fish and its potential keeping time leading to food loss (Abolagba *et al.*, 2011).

Preserving food and other perishable products like fish and meat generally involves processes that impede growth of microorganisms either by the addition of growth inhibiting ingredients or adjusting storage conditions by freezing or drying (Akise *et al*., 2013). Processing methods affect the microorganisms in fish in different ways, resulting in different types of micro-flora and different risks from spoilage organisms and pathogens.

In dried fish, the micro-flora are prevented from growing by the storage method used and the product may have a long shelf life in the preserved state. However, the microbial load of fish rarely indicates the quality of the fish, but gives an indication of the risk of spoilage induced since each of the organisms has

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different ways of affecting the health conditions of consumers of such contaminated fish (Gram *et al*., 2000).

Microbial tests of fish and fish products are used by the industry for contractual and internal purposes and by the authorities to check that the microbiological status is satisfactory (Jay, 1992). The micro-flora in which fungi are a part consists of the microorganisms that normally live with the animals. Studies on microflora count and characterization are many in order to establish a baseline that is satisfactory for the consumption populace. Such microflora isolation studies have been reported by Martin (1994), Olawale *et al*. (2005), Adesokan *et al*. (2005), and Abolagba and Igbinevbo (2010) for smoked fish (*Clarias spp*) sold in markets in Benin Nigeria. It is generally accepted that fish with microbial load greater than10^6cfu/g is likely to be at the stage of being unacceptable from the microbiological point of view and unfit for consumption (Cheesbrough, 2000). Akise *et al.* (2013) reported that high microbial load and unfavourable composition from smoke-dried *Lutjanus agennes* (Red Snapper), *Mugil cephalus* (Mullet) and *Chrysichthys walkeri* (Catfish) during shelf storage poses a serious health concern for consumers and public health workers. This study, therefore seeks to identify the fungal load of smoked *Clarias gariepinus* sold in selected markets in Ibadan metropolis.

MATERIALS AND METHODS

Collection of the fish samples

Six (6) smoked African catfish were randomly obtained from Dugbe, Aleshinloye, Bodija and Sango markets in Ibadan metropolis. The fish were carefully packed into labelled polythene bags and kept in a clean container and transported to the microbiology laboratory of the Federal College of Animal Health and Production Technology, Ibadan, Nigeria where they were properly weighed and used for mythological studies.

Isolation and characterization of micro-flora

One gram of each fish sample was taken and crushed in a mortar with pestle. Nine millilitres sterile distilled water was added and serially diluted up to 10^{-6}fold. Thereafter, 1ml from each suspension was poured plated using freshly prepared Sabouraud's Dextrose Agar. The plates were covered and gently swirled to mix and allowed to gel. The Sabouraud's Dextrose Agar plates were inverted and incubated at 25 ^{0}C for 24 hours. Representative colonies emerging from the plates were grouped according to their cultural characteristics, purified by repeated sub-culturing and maintained on appropriate agar slants as stock cultures. The fungi isolated were identified by simple staining techniques as described by Claus (1992) and biochemical tests were carried out according to the methods described by Harrigan and McCance (1976) as well as Seeley and Van Demark (1972) on morphology, motility, spore staining, catalase, coagulase production, starch hydrolysis and sugar fermentation. Colonies which developed after incubation were subjected to counting. The total fungal counts were expressed as spores/g.

Statistical analysis

Data obtained from the experiment were subjected to one-way analysis of variance (ANOVA) using SPSS 13.0 for Windows. Differences between the means were determined using Duncan's multiple range test at 95 % confidence level (p=0. 05).

RESULTS

Fungal loads of selected smoked catfish from some markets in Ibadan.

Table1 showed the fungal load of differently sourced smoked catfish in Ibadan metropolis. The fungal load of catfish sourced from Bodija markets was the highest which was significantly different ($p<0.05$) from the fungi load sourced from other markets. There was no significant difference ($p>0.05$) in the fungal load of catfish sampled from Aleshinloye and Dugbe markets.

Table 1: Fungal load of smoked catfish from selected markets in Ibadan

Market Location	Fungal load (spores/g) x 10^4
Aleshinloye	1.15 ± 0.21^c
Dugbe	1.10 ± 0.14^c
Bodija	3.15 ± 0.21^a
Sango	2.10 ± 0.14^b

Means with row having different superscripts are significantly different ($p<0.05$).

Table 2 shows the probable fungal isolates from smoked catfish from selected markets in Ibadan.*Fusarium* and *Penicillium* species were identified on fish sampled from Dugbe market. *Rhizopus spp* was the only fungi isolate found in fish sampled from Bodija market. Three fungi isolate, *Aspergillius*, *Fusarium* and Penicillium species were identified in fish samples from Sango market.

Table 2: Fungal isolates from differently sourced smoked catfish from selected markets

Fungi Isolates	Markets			
	Aleshinloye	Dugbe	Bodija	Sango
Rhizopus spp	-	-	+	-
Aspergillus spp	-	+	-	+
Fusarium spp	+	-	-	+
Penicillium spp	+	-	-	+

Key: + = present - = absent

DISCUSSION

The microbial load on the smoked fish recorded in this study fall within the maximum recommended bacterial count for good quality fish product, i.e. $5x10^5$ (5.7 log10 cfu/g) (ICMSF, 1986). Cheesbrough (2000) reported that fish with microbial load of less than 10^6cfu/g is acceptable from the microbiological point of view. The study also established that all the smoked fish sampled from Aleshiloye, Dugbe, Bodija and Sango markets harboured one micro-organism or the other. Ayeloja *et al.* (2012) reported that the microbial load in smoked fish sold in Ibadan, Nigeria was *Aspergillus flavus, Penicillium spp., Fusarium oxysporum, Trrichoderma spp.* and *Ceotrichium albidium*. Most of the organisms found in these smoked fish are those commonly found in soil and water. The fungi isolated in this study are also similar to the microorganisms reported by Olawale *et al.* (2005) and Adesokan *et al.* (2005). Martin (1994) reported *Aspergillus niger* as part of the commonest microorganisms associated with smoked fish. Similar microorganisms were also reported by Abolagba and Igbinevbo (2010) in smoked fish (*Clarias spp.*) sold in Benin metropolis.

The results could not establish whether contamination occurred before or after smoking. Venugopal (2002) established that contamination of fish, particularly by pathogens may occur prior to harvest, during capture, processing, distribution and/or storage. Other studies dealing with different processing methods have similarly concluded that the plant and processing environment may be the source of product contamination rather than the raw material. However, this does not exclude the possibility that the fresh fish is an important initial source for contaminating processing equipment and the environment (Vogel *et al*., 2001). However, water could be a vehicle for the transmission of many microorganisms (Kirby *et al*., 2003). The occurrence of *Aspergillus, Rhizopus, and Penicillium* species could be due to absorption of moisture during storage, the storied fish might have reabsorbed moisture from the environment which then supported the growth of the microorganisms in addition to the contamination during processing, handling and display on the market stall (Ayolabi and Fagade, 2010).

This study indicated that smoked catfish sold in the various markets in Ibadan are best for consumption as the microbial load still falls within acceptable limits for human consumption. It is recommended that fish

processors should ensure that fish products are properly hot smoked and dried so as to prevent mould growth.

REFERENCES

Abolagba, O.J. and Igbinevbo, E.E. (2010). Microbial load of smoked fish (*Clarias sp)* marketed in Benin Metropolis, Nigeria. *Research Journal of Fisheries and Hydrobiology*, 5 (2): 99-104.

Abolagba, O. J., Adekunle, A. T., Dede, A. P. O. and Omoigui1, G. O. (2011). Microbial assessment of smoked fish (*Clarias spp*.) in Benin Metropolis, Edo State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment*. 7(3):55-58.

Adesokan I. A, Ogunbanwo S.T., and. Odetoyinbo B.B. (2005). Microbiological quality of selected brands of beer in Nigeria. *In: the Book of Abstracts of the 29th Annual Conference and General Meeting (Abeokuta 2005) of Nigerian Society for Microbiology (NSM),* University of Agriculture, Abeokuta, 6-10th November, 21Pp.

Akise, O.G., Abolagba, O. J. and Eyong, M. M. (2013). Mycoflora of three fish species smoke-dried using rubber wood (*Hevea brassillensis*) in Nigeria. *Greener Journal of Agricultural Sciences.* 3 (5):396-402.

Ayeloja, A. A.., George, F. O. A., Jimoh, W. A. and Abdulsalami, S. A. (2012). Microbial load on smoked fish sold in Ibadan, Oyo State. *Proceeding of the 27th Annual Conference of Fisheries Society of Nigeria (FISON) at Banquet Hall, Government House, Yenagoa, Bayelsa State on 25th-30th November 2012*, 223 – 227.

Ayolabi, C. I. and Fagade, O.E. (2010). Mycological evaluation of smoked fish from the retail outlets in Ago-Iwoye, Ogun State, Nigeria. *Journal of Life and Physical Science Acta SATECH*, 3 (2): 65-66.

Cheesbrough, M. (2000). *District laboratory practical in tropical countries*. Part 2, Cambridge University Press, United Kingdom, 63-70.

Claus, D. (1992). A standardized gram-staining procedure. *World Journal Microbial Biotechnology* 8:451-452.

Gram, L., Oundo, J.O. and Bon, J. (2000). Shelf-life of fish depends on storage temperature and initial bacterial load. *Tropical Science*. 25: 28 - 30.

Harrigan, W.F. and Mc-Cance, M. E. (1976). *Laboratory methods in food and dairy microbiology*. Academic London, 452 (8):461–470.

ICMSF (1986). *Sampling for microbiological analysis: Principles and specific applications*, 2nd Edition. Oxford: Blackwell Science, 398Pp.

Jay, J. M. (1992). *Modern Food Microbiology. Microbiological indicators of food safety and quality, principles and quality control, and microbiological criteria*. New York: Van Nostrand Reinhol.

Kirby, R. M., Bartram, B. and Carr, R. (2003). Water in food production and processing-Quality and quality concerns. *Food Control*, 14:283-299.

Martins, A. M. (1994). *Fisheries processing: Biochemical applications*. Published by Chapman and Hall, London, 1-88.

Olawale, A.K., Oluduro, A.O. and Famurewa, O. (2005). Evaluation of microbiological and sanitary Standards of canteens and eateries in Osun State Polytechnic, Iree. In: The book of abstract of the *29th Annual conference and general meeting of the Nigerian Society for Microbiology Abeokuta, 6-10th November*, 19Pp.

Oparaku, N. F. and Mgbenka, B. O. (2012). Effects of electric oven and solar dryer on a proximate and water activity of *Clarias gariepinus* Fish. *European Journal of Scientific Research*, 81 (1): 139-144.

Seeley H.W., (Jr.) and Van-Demark, P.J. (1972). *Microbes in action- a laboratory manual of Microbiology*. Freeman Press, San Francisco, 361Pp.

Venugopal, V. (2002). Biosensors in fish production and quality control. *Biosensors and Bioelectronics*, 17: 147-157.

Vogel, B.F., Huss, H. H. and Ojeniyi, B. (2001). Elucidation of *Listeria monocytogenes* contamination

routes in cold-smoked salmon processing plants detected by DNA-based typing methods. *Applied and Environmental Microbiology*, 67(6):2586-2595.