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A survey of fungal infestation in some commercially important fishes from Lapai – Agaie reservoir, Niger State. Nigeria

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Abstract
Fish spoilage caused by fungi is one of the constraints to the quality of fish supply in Niger State. A survey of fungi infestation of two commercially important fishes (*Tilapia zilli* and *Clarotes macrocephalus*) was carried out in Lapai – Agaie Reservoir, in Lapai Local government Area, Niger State, Nigeria, from April to July, 2012. Samples of fresh live fish were randomly selected from the fishermen monthly during the study period. The samples were transported in a sterile polythene bag to the laboratory where the scale and the gills were aseptically collected, and cultured on Potatoes Dextrose Agar (PDA). The fungi isolated were *Aspergillus fumigatus*, *Aspergillus niger*, *Aspergillus wentii*, *Aspergillus nidulans*, *Penicillium digitatum*, *Penicillium roqueforti*, *Aspergillus janthinellum* and *Saccharomyces cerevisae*. Some of these fungi isolated were known to cause various fungal diseases in fish and invariably spoilage. This study therefore recommends proper smoking of the fish before consumption.

Key words: *Aspergillus* spp., *Clarotes macrocephalus*, fungal colonization, *Tilapia zillii*

Introduction

Water resources of Nigeria are extensive over 14 million of inland water bodies have been identified, which include reservoirs, lakes, ponds and major rivers (FDF, 2007). According to Ita *et. al.*, (1985), Niger state has about 772, 243.50 hectares of reservoir and lakes , Kainji, Jebba, Shiroro, Tagwai, Tunga kawo, Suleija and Kontagora reservoirs. Ugoala and Yem (2005), estimated the actual fish production from the estimated 14 million hectares of reservoirs, lakes, ponds and major rivers in Nigeria as 1, 016, 925 metric tomes annually, while the estimated annual fish consumption demand in Nigeria was said to be over 1.3 million metric tonnes (Alamu *et al.*,2004). Therefore Nigeria's domestic fish production hardly meets the local demand, and there have been yearly increase in fish importation to meet this demand.

Lapai - Agaie Reservior is located at Longitude 6° 34' E and Latitude 9° 13' N on River Jatau Niger State. River Jatau join River Chanchaga at Ebba, which is one of the major tributaries of the River Gbako that drains into River Niger.The reservoir is located near Bakajeba village, about 20km to the north of Lapai town and about 25km south of Paiko town. Both town and the reservoir are found to the south of Minna, the capital city of Niger state. Inland water bodies flowing through towns and cities in Nigeria are often highly polluted due to domestic and industrial refuse and sewage

deposited into them (Tsadu *et al.*, 2006). This turns them into a breeding ground for pathogenic microbes and parasites. And as a result, aquatic resources including fish in such water are predisposed to microbial infestation including fungal infestation (Baldwin and Knapp, 1967). Fungal contamination causes rapid post-harvest deterioration of Fish. Idiogede and Tsadu (2003) reported fungal contamination of some commercially important fishes sold in the market in Minna, Niger State, and also noted that fungal contamination was one of the causes of fresh fish shortage in Niger State in general. Fish spoilage due to fungal infestation is one of the major obstacles to fish supply in Niger State. It was in view of this that the present research was conducted to survey fungal colonization in some commercially important fishes from Lapai-Agaie Reservoir, in Niger State, Nigeria.

In Nigeria, the following works, on the study of fish parasites especially fungal infestations has been recorded Awachie (1966), Ukoli (1970), Ugwuzor (1987), Onwuliri and Mgbemena (1987), Anosike *et. al.*,(1992), and Opana and Okon (2002).

Materials and Method

Collection of samples

Samples of fresh fish (*Tilapia zilli* and *Clarotes macrocephalus*) were brought from fishermen at catch from Lapai – Agaie Reservoir, in Niger State, Nigeria monthly between April and July 2012. They were wrapped in dumillium foil, placed bin sterile polythene bags containing ice blocked and transported to the laboratory of Department of Biology, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria. Samples were analysed for fungal infestation within 24 hours.

Preparation of culture medium

Potato Dextrose Agar (PDA) was prepared aseptically 300g of peeled sliced Irish potato was boiled for 30 minutes in 500ml distilled water. The filtrate was collected by decantation and made up to1000Cm^3. 20g Agar – agar and 20g Dextrose sugar were added to the filtrate and autoclaved at 121^{0}C for 15 minutes.

Fungi isolation

To every 10ml of PDA poured into the petri dish, 0.1ml of Chloraphenicol was added to prevent bacterial contamination. Gills and scales of the fish were aseptically cut using sterile scissors and plated separately on PDA. Three replicates of each was made and incubated at room temperature (28 ± 2°C) for 24 hours. Fungi sub cultures were made from the mix culture obtained. Fungi isolates were identified using families of the world monographs (Onion *et. al.*, 1985, Ogbuile *et. al.*, 1998, Cannon and Kirk, 2007, Anadi and Adebola, 2008)

Data analysis

One way analysis of variance was used to compare the percentage frequency of occurrence of fungi on the scale and gills of the fishes.

Results

A total of eight fungal species from 3 genus (Table 1) were isolated and identified from the two species of fishes sampled. Five species of *Aspergillus* two species of *Penicillium* and one species of *Saccharomyces* were identified. However, *A. fumigates, A. janthinellum and S. cerevisae* were not isolated from the fish *C. macrocephalus*.

The result revealed that out of the fungi isolated from the scale of *Tilapia zilli* (Table 2), *Aspergilus niger* has the highest percentage infestation of 35.4%, followed by *Penicillium digitatum* (23.6%) and no *A . wentii* was isolated. Only four species were isolated from the gills (Table 2) of *Tilapia zilli* (*A. niger, P. digitatum, A. fumigates* and *S. cerevisae*) Table 3 shows that from *C. macrocephalus* scale only four species of fungi were isolated from the gills and the scales. *Aspergillus niger* was half (50%) of the total fungi isolated in each of the parts explored (scales and gills). However, *A. fumigates, A. janthinellum and S. cerevisae* were not isolated in the species. The result revealed that the relative percentage frequency of infestation of these fungi in both fishes (Table 4) were significantly different ($P<0.05$). However, the relative % frequency of infestation of *A. niger* on the scales and gills were not significantly different on both fishes ($P<0.05$). The relative total percentage frequency of infestation (Table 5) of all the fungi comparing both fishes were generally not significant ($P<0.05$)

Table 1: List of fungi isolated from *Tilapia zilli* and *Clarotes macrocephalus* from Lapai – Agaie Reservoir, Niger State. Nigeria

S/No.	ISOLATED FUNGI	*TILAPIA ZILLI*	*CLAROTES MACROCEPHALUS*
1	*Penicillum digitatum*	+	+
2	*Aspergillus fumigates*	+	–
3	*Aspergillus janthinellum*	+	–
4	*Aspergillus niger*	+	+
5	*Saccharomyces cerevisae*	+	–
6	*Aspergillus nidulans*	+	+
7	*Penicillium roqueforti*	+	+
8	*Aspergillus wentii*	+	+

Keys: + Present - Absent

Table 2: Percentage frequency of infestation of fungi infestation in *Tilapia zilli* from Lapai – Agaie Reservoir, Niger State . Nigeria

ISOLATED FUNGI	*Penicillum digitatum*	*Aspergillus fumigates*	*Aspergillus janthinellum*	*Aspergillus niger*	*Saccharomyces cerevisae*	*Aspergillus nidulans*	*Penicillium roqueforti*	*Aspergillus wentii*
SCALE	23.6	17.7	5.9	35.4	5.9	11.8	5.6	0.0
GILL	30.0	10.0	0.0	40.0	10.0	0.0	0.0	10.0

Table 3: Percentage frequency of infestation of fungi infestation in *Clarotes macrocephalus* from Lapai – Agaie Reservoir, Niger State . Nigeria

ISOLATED FUNGI	*Penicillum digitatum*	*Aspergillus fumigates*	*Aspergillus janthinellum*	*Aspergillus niger*	*Saccharomyces cerevisae*	*Aspergillus nidulans*	*Penicillium roqueforti*	*Aspergillus wentii*
SCALE	30.0	0.0	0.0	50.0	0.0	0.0	10.0	10.0
GILL	16.6	0.0	0.0	50.0	0.0	16.7	0.0	16.7

Table 4 : Relative percentage frequency of infestation of fungi infestation on Tilapia zilli and *Clarotes macrocephalus* from Lapai – Agaie Reservoir, Niger State . Nigeria

Isolated fungi	Scale (%)		Gill (%)	
	T. zilli	*C. Macrocephalus*	*T. zilli*	*C. macrocephalus*
Penicillum digitatum	23.6^{b}	30.0^{b}	30.0^{b}	16.6^{a}
Aspergillus fumigates	17.7^{b}	0.0^{a}	10.0^{b}	0.0^{a}
Aspergillus janthinellum	5.9^{b}	0.0^{a}	0.0^{a}	0.0^{a}
Aspergillus niger	35.4^{a}	50.0^{a}	40.0^{a}	50.0^{a}
Saccharomyces cerevisae	5.9^{b}	0.0^{a}	10.0^{b}	0.0^{a}
Aspergillus nidulans	11.8^{b}	0.0^{a}	0.0^{a}	16.7^{b}
Penicillium roqueforti	5.6^{b}	10.0^{a}	0.0^{c}	0.0^{c}
Aspergillus wentii	0.0^{a}	10.0^{b}	10.0^{a}	16.7^{b}

Percentage frequency followed by the same letter along the row were not significantly different at $P<0.05$

Table 5: Relative total percentage frequency of fungi infestation on T. zilli and C. macrocephalus (Scale and Gill) from Lapai – Agaie Reservoir, Niger State . Nigeria

Isolated fungi	Total percentage	Frequency of infestation
	T. zilli	*C. macrocephalus*
Penicillum digitatum	28.02[a]	24.50[a]
Aspergillus fumigates	14.48[a]	3.02[b]
Aspergillus janthinellum	3.08[b]	0.00[a]
Aspergillus niger	39.42[a]	56.18[a]
Saccharomyces cerevisae	3.60[b]	0.00[a]
Aspergillus nidulans	4.15[a]	3.90[a]
Penicillium roqueforti	2.02[a]	3.02[a]
Aspergillus wentii	5.23[a]	9.38[a]

Percentage frequency followed by the same letter along the row are not significantly different at $P<0.05$

Discussion

Fungi species identified from the isolates of the study were *Aspergillus niger, A. wentii, A. nidulans, A. janthinelum A. fumigatus, P.digitatum, P. roqueforti* and *Saccharomyces cerevisae*. The result revealed that most of the fungi that colonize different part of the two species of fish were mostly *Aspergillus* genus particularly *Aspergillus niger*, this agreed with the work of Abubakar and Tsadu (2003), who reported the highest percentage of occurrence of *A. niger* out of seven different fungi species isolated from fish obtained from water bodies and fish market. The high frequency of occurrence might be due to ability of *Aspergillus* species to grow under different environmental conditions of the host (Olufemi, 1984). The second most prevalent genus is *Penicillium* species, whose member are ubiquitous and like cool moderated climate (Rubin, 1990). The occurrence of *Aspergillus sp.* and *Penicillium* is a significant public health concern, as some species have been known to be common agents of food spoilage. The toxins they produce are carcinogenic, mutagenic and tetratogenic to human. *Aspergillus niger* and *Aspergillus fumigatus* are few of the species which cause diseases known as Aspergillosis (disease of the lung) (Abubakar, 2001; Idiogede, 2001; Bozkurt, 2008).

Eyo and Balogun (1992), reported that fungal contamination is a major limitation to good quality fish processing, especially in areas where the relative humidity is always high. This study revealed that different species of fungi can infested different part of the fish body and may probably affect the fish quality, value, patronage by the consumers and lead to low income.

In conclusion, this study indicates that fungi do not only affect animals on land but also in aquatic habitats, and can infest any part of the fish body.

It is hereby recommended that fishes should be properly cooked or smoked before eating as most of the fungi that colonize fishes are infectious to man. If fishes are boiled for a longer period, the heat kills the spores, and terminates the continuity of their life cycle.

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