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Original Article

MYCOFLORA SURVEY OF THREE COMMERCIALLY IMPORTANT FISH SPECIES FROM TAGWAI LAKE, MINNA NIGERIA

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ABSTRACT

A survey of the mycoflora of S*ynodontis ocellifer, Clarias anguillaris* and S*chilbe mystus* from Tagwai Lake, Minna, Nigeria was carried out for three months (June to July, 2008). The fungi were isolated from three selected parts of the fish body namely, gill, skin and tail. Microbial growth was measured by direct cell count using Stuart colony counter. Altogether, 24 fungal species, mostly members of the mould group, were encountered in the three fish species. The relative distribution of the fungal species in the different parts of the three fish types were similar, and the total number of fungal species per fish type were not significantly different (P>0.05). Reasons were advanced for these results and the implications highlighted. It was concluded that fungal infestation is prevalent in the fish species sampled in Tagwai Lake and that the three (3) fish species sampled were equally susceptible to fungal infestation.

Key words: Survey Mycoflora, Fish species, Tagwai Lake, Minna, Nigeria.
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INTRODUCTION

In Nigeria, as in many other developing countries of the world, the demand for fish greatly exceeds supply. This problem is accentuated by not been able to meet the demand and supply of the ever increasing population. It is therefore, acknowledge as the efficient means of providing food, which is rich in protein source, income and employment opportunities for the populace. (Ojutiku, 2008). Nigeria is said to import about 800,000 metric tons of fish annually in order to meet her ever increasing demand. (Alamu *et. al*., 2004).

Tagwai Lake was constructed by the impoundment of Tagwai River in 1978 for the domestic water supply to Minna. Inland water bodies flowing through Villages, towns and cities are usually polluted through domestic, agriculture, industrial wastes, and sewages that are emptied into these rivers. This makes the rivers to be vulnerable to pathogenic, microbial and parasitic infections as observed by Tsadu *et al.*, (2006).

As a result of the crucial role played by fish production in bridging the gap in human protein demand, information on the parasitic infections of fish species is of utmost importance. Hudson *et. al.*, (2005). High fish performance is threatened by both biotic and abitoic factors that hinder fishery from attaining its full productivity potential, causing serious shortfall in the supply of fish protein to the populace.Kolo, (1996) and Onuoha (1991). The presence of the fungal species on fish is indicated by white, grey or brown cotton-like growth on the skin, gills or fins (DuHamed, 2007),

According to chowdhury (1997), fungal infection constitute an important aspect of fish pathology resulting in rapid post harvest deterioration of fish and lost of market value, as well as food poisoning and gastro intestinal infection in humans and animals due to aflatoxins produced by some of the fungal species. (Tsadu *et al.*, 2006; Pearson and Dutson, 1994; Oyeleke *et al.*, 2002). Idiogede and Tsadu (2003) particularly reported that the shortage of fish in Minna and it environs is traceable to the contamination of the rivers by the fungal in the area. This situation should not continue. Consequently, this study was designed to identify the mycoflora of *Synodontis ocellifer, Clarias anguillaris* and *Schilbe mystus*. In Tagwai Lake.

Schilbe mystus is more abundance than other *Schilbedae* and is of considerable commercial importance. They are also a fine sporting fish because of their small size. *Synodontis ocellifer*, on the other hand is relatively very small in size and not very abundant in most part of river Niger/Benue. *Clarias anguillaris* is also very abundant in commercial catches along river Niger and Benue at the commencement of the dry season (Reed *et. al.*, 1967).

MATERIALS AND METHODS

Study Area

The study was carried out in Minna, located within longitude 6° 33 E and latitude 9° 3'N, covering a land area of 88km^2 (The Nigerian Congress, 2007). The area has a tropical climate with mean annual temperature of 30.2°C, relative humidity of 61% and annual rainfall of 1334mm. The vegetation cover reflects that of savanna zone, dominated by grass but with scattered tree species. There are 2 distinct seasons, i.e., a rainy season between April and October, and a dry season between November and March. Tagwai Lake is about 10km away from Minna town. The lake is about 25m deep, 1.8km wide and has a capacity for storing 28.3million cubic metres of water (Alkali, 1994).

Collection, Processing and Identification of Fish Specimens

Fresh samples of *Synodontis ocellifer, Clarias anguillaris* and *Schilbe mystus* were harvested from Tagwai Lake, between June and August 2008. The lake was visited once a month for sample collection during the study periodCollected fish specimens were transported to the laboratory in sterile polythene bags containing distilled water. The specimens were maintained at temperatures below 0°C in a freezer prior to analysis. The fish specimens were identified using the keys of Reed *et al.* (1967).

Culture Media Preparation

Potato Dextrose Agar (PDA) media was preparedfollowing the techniques of Oyeleke and Manga (2008). Briefly, 300g of sliced Irish potato tuber was cut into 500mls of distilled water. The mixture was allowed to boil for about 45 minutes at 100°C. The material was then filtered through layers of muslin cloth. After which 20g each of Agar and glucose powder and 0.5g chloraphenicol were added to the filtrate and autoclaved at 121°C for 15 minutes.

Smearing of Culture Media

The gills, skin and tail parts of the fish specimens were carefully rubbed with sterile swab sticks and used to smear the surface of the culture media under aseptic conditions (Ayanwale, 2004). The treated samples were then incubated at room temperature for 72 hours. Thereafter, the culture media were examined for fungal growth.

Examination and Identification of Fungal Species

The fungi species were examined macroscopically based on their

morphological appearances. They were also examined microscopically after the techniques of Oyeleke and Manga (2008).

Fungal Colony Count

The fungal colonies were counted using Stuart colony counter. The numbers of colonies in a plate were multiplied by the reciprocal of the dilution factor. Calculation was done for 1ml of original sample as a test tube per plate. The average number of colonies per plate segment was determined and used in estimating the total count (Ogbulie *et. al.*, 1998).

Collection of Meteorological Data

Meteorological data of rainfall, atmospheric temperature and relative humidity were obtained from the weather station of Minna Airport, Nigeria

Data Analysis

Students t-test was used to compare two sets of data while, the Chi-square test was used to compare differences among multiple sets of data (Gomez and Gomez. 1984). Cross correlations in fungi infestation rates among fish body parts, as well as, between fish species and climatic variables were determined using Linear Coefficient correlation.

RESULTS

The mycoflora load of the fish species investigated is as shown in Table 1. On the whole, 24 fungi species were encountered in the three fish species investigated. Ten of the fungi species occurred commonly in the three fish species including, and these *Aspergillus flavus*, *A. fumigatus*, *Microsporum canis*, *Mucor sp*, *Rhadotorula rubra*, *Trichophyton concentricum*, *T. equinum*, *T. schoenleinii*, *T. mentagrophytes* and *T. quinokeanum*. However, the highest number of mycoflora species (19 species) was isolated from *Schilbe mystus* while; the least released (15 species) was recorded in *Synodontis ocellifer*.

Table 2 shows the fungal infestation of the three different body parts examined. Though, the infestation rates of the body parts varied considerably in the individual fish species, the patterns of distribution of the fungi species in *Schilbe mystus* were similar to those of the aggregate fish population. The most heavily infested fish species was *Schilbe mystus*, followed by *C. anguillaris and the least was S. mystus*.

The cross-correlation of fungal infestation rates among the fish body parts are shown in Table 3. While strong positive correlations existed between fungi infestation rates of the skin and gill ($r = 0.54$), as well as, tail and skin ($r = 0.74$), the correlation between the gill and tail was weak and negative ($r = -0.18$). Again, correlations between infestation rates and climatic variables are shown in Table 5. Except between rainfall and *C. anguillaris*, as well as, temperature and aggregate fish population, strong correlations were found between fungi infestation rates of the fishes and climatic variables.

Table 4 shows monthly variations in fungal infestation rates of the fish species.The results indicated that differences in fungi infestation rates during the study period were not statistically significant ($P > 0.05$), both in the aggregate fish population and individual fish species.

Table 1: Distribution Pattern of mycoflora in three commercially important fish species from Tagwai lake, Minna, Nigeria.

Fungus species	*Synodontis ocellifer*	*Clarias anguillaris*	*Schilbe mystus*
Aspergillus niger	+	+	-
Aspergillus flavus	+	+	+
Aspergillus fumigatus	+	+	+
Candida albicans	+	+	-
Candida parapsilosis	-	-	+
Candida guilliermondii	-	+	+
Candida stellatoidea	-	-	+
Microsporum canis	+	+	+
Microsporum distortum	-	+	+
Mucor species	+	+	+
Penicillium species	-	-	+
Rhodotorula rubra	+	+	+
Scopulariopsis species	-	+	-
Trichophyton concentricum	+	+	+
T. equinum	+	+	+
T. schoenleinii	+	+	+
T. mentagrophytes	+	+	+
T. megninii	+	-	+
T. gallinae	+	-	-
T. quinokeanum	+	+	+
T. tonsurans	-	+	+
Torulopsis glabrata	-	+	+
T. dattila	-	+	-
Verticillium species	+	-	+

Key: + = Present and − = Absent

Table 2: Fungal Infestation rates of different body parts three fish species from Tagwai Lake, Minna, Nigeria.

Fish Species	**Gill**	Skin	Tail	Mean
S. ocellifer	16.00^{a}	29.00^{b}	25.00^{b}	23.33 ± 6.66^{b}
C. anguillaris	19.00^{b}	25.00^{c}	11.00^{a}	18.33 ± 7.02^{b}
S. mystus	14.00^{a}	18.00^{b}	12.00^{a}	14.67 ± 3.06^{a}
Aggregate mean	16.33 ± 2.25^{a}	24.00 ± 5.57^{b}	16.0 ± 17.81^{a}	18.76 ± 5.58^{a}

Values denoted by the same superscript in a row are not significantly different ($P>0.05$).

Table 3: Cross-correlations of fungal infestation rates among fish body parts.

Body part	**Gill**	**Skin**	**Tail**
Gill	1.000		
Skin	0.5353	1.000	
Tail	-0.1781	0.7359	1.000

Table 4: Monthly variations in fungal infestation rates of three fish Species from Tagwai Lake, Minna, Nigeria.

Months	***S. ocellifer***	***C. anguillaris***	***S. mystus***	**Mean**
June	21.30[a]	20.00[a]	13.00[a]	18.10 ± 4.46[a]
July	24.60[a]	20.60[a]	16.00[a]	20.40±30[a]
August	24.60[a]	18.60[a]	16.00[a]	19.73+4.41[a]
Mean	23.50±1.56[a]	19.73±1.03[a]	15.00±1.73[a]	19.41±4.39[a]

Value denoted by same superscript in a row are not significantly different (P>0.05).

Table 5: Correlations between fungal infestation rates of three fish species and climatic variables in Minna, Nigeria.

Fish species	**Rainfall**	**Temperature**
S.ocellifer	0.9821	-0.8693
C.anguillaris	-0.0402	0.6851
S.mystus	0.9826	-0.8639
Aggregate mean	0.6417	-0.3476

DISCUSSION

The findings of this study agree with those of Ayanwale (2003) and DuHamel (2007) who reported that different parts of fish harbour various types of fungi. Generally, the large infection of the fish species by *Trichophyton* and other mould species in this work might be due to their ability in utilizing a wide range of organic substrates for growth.

The result of this work are in agreement with the work of Idiogede *et al* 2003 who reported that shortage of fish in Minna and its environs may be traceable to the fungi species in the area. The occurrence of *Aspergillus* species is of significant public health concern. *A. niger* and *A. flavus* have been known to be common agents of food spoilage most especially in the tropics where there spores are widely distributed. Some species of this organism are known to secrete toxins known as aflatoxins which when ingested by man or animal mostly affects the liver and no effective therapeutic treatment has been known yet. (Rubin, 1990; Pearson and Dutson 1994; Oyeleke *et. al*, 2002).

CONCLUSION

This work shows that fungi infestation is very prevalent among the various fish species in Tagwai Lake in Nigeria, mostly of the mould group. Fungi infestation was found to be significantly ($p<0.05$) higher in the fish skin that any other part of the fish body. The study point's to the fact that mould fungi, particularly those of *Aspergillus* and *Trichophyton* species are as common as the infestation of *Saprolegnia* and *Aphanomyce*. (Chowdhury, 1997).

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