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Research Paper

Assessment of the microbiological quality of fish smoked traitors in the city of Kisangani. Case *Oreochromis niloticus.*

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Summary
Fish are very perishable food commodities, having a relatively elevated change speed after the fishing but their process of transformation and merchandising remains even artisanal and often affect their microbiological quality, capable to cause some illnesses. This survey aims to value the microbiological quality of fish smoked and sold expenses in the city of Kisangani, while identifying the bacterial species of the family of Staphylococaceae and saccharomycetaceae responsible of the infectious illnesses at the human beings.
The microbiological analyses carrying on the numbering of the total germs have been made according to the conventional norms. The rate of contamination by the total germs reached an average of: for fish smoked coming from the township of Kabondo, with a concentration of 4,43.10¹¹ UFC/gs. are They followed by those of the common Kisangani (4,58.10¹⁰ UFC/g), of the common Makiso (4,43.10¹⁰ UFC/g), of the common Tshopo (4,41.10¹⁰ UFC/g), of the common Lubunga (4,31.10¹⁰ UFC/g), finally the common Mangobo (3,31.10¹⁰ UFC/g). Him ya had not the development of the Staphylococci in all townships.
The concentrations of the fungal flora are especially abundant among fish smoked coming from the township of Makiso, the common Kisangani, and the common Kabondo, that are of 3.10¹² UFC/gs. These levels are followed by those recorded in the common Tshopo (28 300 UFC/gs), the common Mangobo (13 200 UFC/gs), and the common Lubunga (133 UFC/gs). For the cool fish, the fungal flora has been detected solely in the samples descended of the common Lubunga (3 UFC/gs) and the common Kabondo (2 UFC/gs).
***Key words**: Let's pitch smoked, Microorganisms.*

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I. Introduction

Fish is a source of food and subsistence accessible to the big majority of the populations in the world, notably for the African population (Fao 2016). The world production of fish has been estimated to about 179 million tons, of which 156 millions of tons have been used for the human consumption, what is equivalent to a yearly offer estimated per capita to 20,5 kg (Fao, 2020).

The aquaculture greatly contributes to the national food security, to the reduction of poverty and to the economy, factors that often determines the support of the decision-makers to a determined sector. However, the quantitative assessment of these merits is documented badly, in particular in the developing countries (Fao, 2018).

The culture of tilapia has a long history that goes back up in old Egypt, but there are only some decades, his/her/its real potential for the commercial aquaculture has been recognized entirely. Africa is the origin natural of tilapia but during the last 40 years, numerous species have been introduced in Asia as well as in South America, and are propagated themselves of it in several natural water systems (Mires, 1995).

Fish is a very substantial food commodity for his/her/its gustatory and nourishing value. He/it constitutes a precious source of proteins comfortably digestible to elevated biologic value. He/it is also an excellent vector of trace elements and vitamins (Elyounoussi and al., 2015).

In Democratic Republic of Congo, fish occupies a place of choice in the human food because of his/her/its yearly permanent availability. Every inhabitant consumes 5,7 Kg on average of it and he is very often presented in the country under salty shape, smoke and dried (Anonyme, 2005).

The man eats food of origin animal or plant, raw, cooked or dried. All this food risks to become of real vectors of illnesses when they contain toxic chemical substances (heavy metals, pesticides…) or of the pathogenic biologic agents (viruses, bacteria and mushrooms). The presence of these dangers in food is almost always in relation with various contaminations that are a matter for a lack of hygiene.

The present survey has for objective to value the presence possible of the staphylococci and mushrooms capable to have some consequences on the health of the public and to give an idea on the hygienic quality of fish smoked and sold expenses in the city of Kisangani.

II. Middle, material and Methods

Zone of survey.

This survey has been done in the city of Kisangani county seat of the Province of the Tshopo, situated to the Northeast of the Democratic Republic of Congo. His/her/its geographical coordinates are 0°31' North latitude, 25°11' longitude is and 396 - 410 m of altitude. The different targeted markets are: Isomela (township of Lubunga), Balese (township of Mangobo), social Home (township of Kabondo), Limanga Fond of advance (Kisangani Township), Fifteenth Avenue (township of the Tshopo) and central Market (township of Makiso).

Actual withdrawal and conditioning of the samples

The sampling has been made in an uncertain way by the saleswomen of fish smoked *Oreochromis niloticus* and expenses in the different markets. The samples kept then in them limp then in plastic sterile routed to the Provincial Laboratory of Health Publique/Kisangani for the microbiological analyses.

Setting in culture and conservation of the microbial species

A withdrawal of 1g on every sample has been done with the help of a sterile swab that has been dived in 10 ml of nourishing soup (meadow culture), put to the refrigerator to 4°C in order to slow down the microbial multiplication. After having united all conditions of setting in culture cleanly on gélose, the pre considered culture as the solution-mother will be activated to 37°C.

II.1Numbering of the microorganisms

II.1.1. Numbering of the Staphylococci

The middle of isolation of Chapman has been used, the samples have been taken of the different dilutions (10°, 10-1, 10-2… 10-10).

- **Principle**

This classic environment allows the selective isolation of Staphylococcus on basis of a tolerance a strong content in NaCl and the differentiation of the species Staphylococcus aureus by the setting in evidence of the deterioration of the mannitol and the frequent development of a pigment. (Rodier and al., 2009).

- **Operative fashion**

A set of limp of Kneaded containing 10 to 15 ml of the middle of Chapman, corresponding to the number of dilution (10° to 10-10) is inoculated by the samples. After homogenization, they limp of Kneaded are hatched to 37°C during 24 hours. The apparition of the sallow colonies permits to confirm the presumptive test.

II.1.2. Numbering of the fungal flora

The fungal flora is isolated in the middle of Sabouraud Dextrose Agar.

- **Principle**

This middle, left in limp of Kneaded or in tubes, is recommended for:

- The isolation of mushrooms from the withdrawals little soiled by the bacteria,
- The culture of the mushrooms in view of their identification,
- The control of barrenness of the pharmaceutical or food products.

The addition of soy peptone, of excerpt of yeast and excerpt of malt, in order to bring many nourishing factors permits a fast development of the mushrooms. (Blvd. https://www.bd.com/fr-fr.)

- **Operative fashion**

1g of the sample weighed is put in solution in the nourishing soup for the enrichment and hatched during 24 hours to 37°C, put then in culture in the middle selective Sabouraud in boxes of Kneaded and that are hatched to 25°C (to the free air to the laboratory) during 3 to 5 days. The results are read by observation of the typical colonies: mildews are easily recognizable thanks to colonies presenting the filaments or hyphes while the yeasts are recognizable by their circular shape.

II.2. Identification of the microorganismes

II.2.1. Identification of the staphylococci

Some suspected colonies on the strong Chapman environment underwent the tests follow: DNAse, The research of catalase, Research of staphylocoagulase, Mannitol.

II.2.2. Identification of the fungal flora

The used middle was the Sabouraud Dextrose Agar. After homogenization and solidification, a minimal quantity of the solution mother is sowed in surface in boxes of Kneaded. The incubation gets used to the temperature of laboratory (25°C) during 3 to 5 days. The results are read by means of test of filamentation of the typical colonies: mildews are easily recognizable thanks to colonies presenting the filaments or hyphes.

- **Test of filamentation or test of filamentation**

Principle: the stump to test is emulsified in the serum. Après3heures of incubation to 37°C, one observes to the microscope the cells of candida presenting" a tube of characteristic germination" of the species. (Https://bibirou1. Over-blog.com.)

Reactive: Plasmatrol OH: to put in solution the content of a small bottle in 0.5ml of water distilled sterile.

- **Operative fashion**

- To deposit 0.5ml of plasmatrol OH in a tube to hémolyse;
- To emulsify to dares it a quantity of culture (appropriated on a strong environment) sufficient to get a light opalescence
- To hatch the tube in the steamroom to 37°C during 3 hours;
- To examine to the microscope a drop of the suspension between blade and gill. If it is about Candida albicans, a certain number of cells presents a tube of germination" in characteristic glove finger.

II.3. statistical Analysis

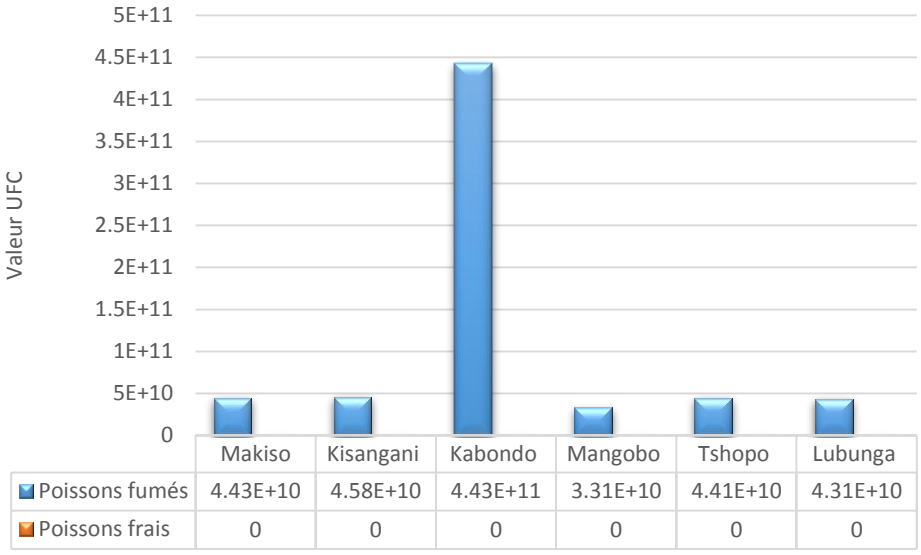
The results have been analyzed according to the device in split contact whose main factor is the type of fish (expenses and smoked) and the secondary factor is the type of the markets (different townships). The recorded data have been treated and have been analyzed with the help of the software Statistix 8.0 according to the model ANOVA 2. The LSD test has been used to the doorstep of p=0,05 for the comparison of the different averages.

III. Results

III.1. Numbering of the microorganismes in the Oreocromis niloticus.

III.1.1 staphylococci

The face 1 below present the values of UFC of the Staphylococci



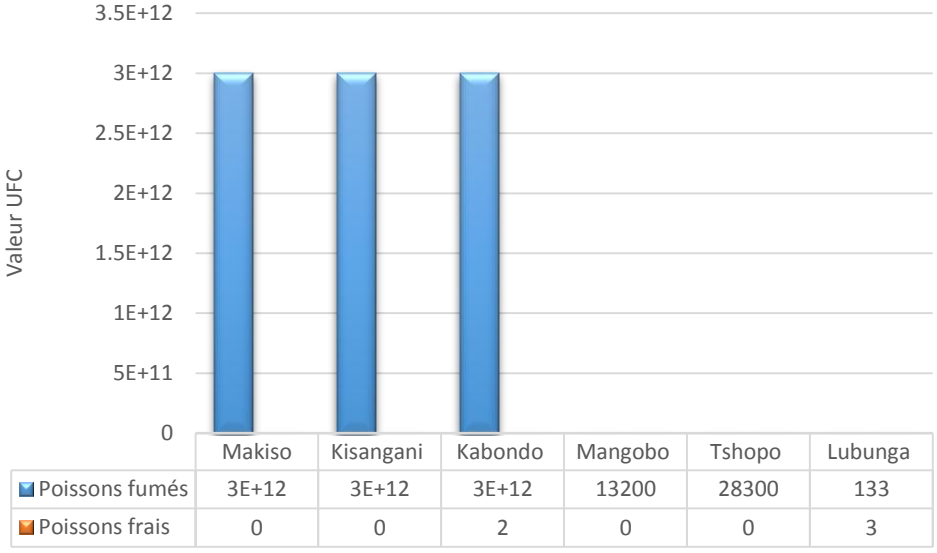
Face 1: Staphylococci

Does this face show that the staphylococci are especially abundant in fish smoked coming from the township of Kabondo, with a concentration of $4{,}43.10^{11}$ UFC/gs. Are They followed by those of the common Kisangani ($4{,}58.10^{10}$ UFC/g), of the common Makiso ($4{,}43.10^{10}$ UFC/g), of the common Tshopo ($4{,}41.10^{10}$ UFC/g), of the common Lubunga ($4{,}31.10^{10}$ UFC/g), finally the common Mangobo ($3{,}31.10^{10}$ UFC/g). Has No staphylococcus been detected in the cool fish.

The statistical analysis achieved with the help of an ANOVA to two factors produced a p been worth lower to 0, 05 (LSD=0, 33). These results indicate that the abundance of the staphylococci is influenced meaningfully by the type of fish and the township of origin.

III.1.2. Fungal flora

The face 2 below present the values of the fungal flora



Face 2: Fungal flora

This face indicates that the fungal flora is especially abundant in fish smoked coming from the township of Makiso, the common Kisangani, and the common Kabondo, with a concentration of 3.10^{12} UFC/gs. These levels are followed by those recorded in the common Tshopo 28 300 UFC/gs, the common Mangobo 13 200 UFC/gs, and the common Lubunga 133 UFC/gs.

For the cool fish, the fungal flora has been detected solely in the samples descended of the common Lubunga 3 UFC/gs and the common Kabondo 2 UFC/gs.

The statistical analysis done with the help of an ANOVA to two factors reveals that the abundance of the fungal flora depends meaningfully on the type of fish and their township of origin (been worth $p < 0,05$, LSD=3,88).

III.2. relative Results to the identification of the microorganisms.

A. Fish smoked

The table 1 below present the isolation and the identification of the Staphylococci

Table 1: Isolation and identification of the pathogenic presumed staphylococci

Townships	Middle Chapman	Tests biochemical				**Coloration gram**	
		catalase	**coagulas**	**mannitol**	**DNASE**		
MAKISO	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles
KISANGANI	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles
KABONDO	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles
MANGOBO	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles
TSHOPO	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles
LUBUNGA	Colonies surrounded with yellow halo	-	-	-	-	+	Cockles

In relation to the different biochemical tests, the table 1 shows us that the sample doesn't have a catalase, a DNASE, mannitol and Coagulase. To what concerns the morphological survey (tests of coloration: Gram), of spherical shapes regrouped in irregular heap, of blue and purple color have been observed, what testifies beautiful and well the cockles (positive Gram) and the presence of the staphylococci in all townships. The identification of germ pathogenic" Staphylococcus aureus" is very important because the ingestion of a toxin secreted by stumps

toxigènes of this species is a type of most current food poisoning that wants to say a type of food poisoning the more observed.
The table 2 below present the isolation and the identification of the fungal flora

Table 2: isolation and identification of the fungal flora.

Townships	Middle Sabouraud Dextrose Agar	Test of filementation	Species
MAKISO	White colonies	+	*Candida albicans*
KISANGANI	White colonies	+	*Candida albicans*
KABONDO	White colonies	+	*Candida albicans*
MANGOBO	White colonies	+	*Candida albicans*
TSHOPO	White colonies	+	*Candida albicans*
LUBUNGA	White colonies	+	*Candida albicans*

The table 2 indicates us the presence of Candida albicans in fish smoked Oreochromis niloticus and in all townships.

B. Cool Fish
The table 3 below present the isolation and the identification of the fungal flora

Table 3: isolation and identification of the fungal flora.

Townships	Middle Sabouraud Dextrose Agar	Test of filementation	Species
KABONDO	White colonies	+	*Candida albicans*
LUBUNGA	White colonies	+	*Candida albicans*

The presence of Candida albicans really signal in fish *Oreochromis niloticus* cool in the two townships.

IV. Conclusion and Discussions

It is in the goal to contribute to the assessment of the microbiological quality of fish smoked and sold expenses in the city of Kisangani that we led the present survey. After the microbiological analyses did we get the results following to the level of the Staphylococci in the township of Kabondo, with an average of $4{,}43.10^{11}$ UFC/gs, the common Kisangani ($4{,}58.10^{10}$ UFC/g), the common Makiso ($4{,}43.10^{10}$ UFC/g), the common Tshopo ($4{,}41.10^{10}$UFC/g), the common Lubunga ($4{,}31.10^{10}$ UFC/g), and finally the common Mangobo ($3{,}31.10^{10}$ UFC/g) is extensively superior to the one of Temgoua T. 2016 an average of $1{,}25.10^{2}$UFC/g had who in the frozen fish sold in the fish stores of the city of Yaoundé but also these averages are superior to the one found by Ouattara 1986 either 12 UFC/gs of product.

One also notes an absence of the staphylococcus aureus in the samples of cool fish, that could justify itself by the fact that these germs are respectively witnesses of fecal contamination and contamination cutanéomuqueuse and could only come from the manipulators (Untermann, 1998)

Our results to the level of the fungal flora are: the common Makiso ($> 300.10^{10}$ UFC/gs), the common Kisangani ($> 300.10^{10}$ UFC/gs), the common Kabondo ($> 300.10^{10}$ UFC/gs), the common Tshopo (28300 UFC/gs) and the common Mangobo (13200 UFC/gs), are extensively superior to those of Oulai and al.2007 that found an average of $4.6.10^{2}$ of germs by gram as superior to those of Djohra N.et al. 2001 that gotten $1.03.10^{4}$ in the salty anchovies. The presence of the fungal flora would be bound to the problem of storage. The smoked fish are let on hurdles of manuring to the ambient air or are kept a long time in packings. In the same way, the exhibition of fish for the sale could also constitute a source of contamination this practice would be at the origin of the post contamination of fish smoked that with his/her/its weak activity in water would be favorable to the proliferation of the mushrooms.

This survey shows us that the smoked fish and sold expenses in the different markets of the city of Kisangani are contaminated by the pathogenic germs notably: the staphylococci and the fungal flora. These same results are also gotten to the levels of food sold in the street (W.H.O. 1998), the epidemiological data in surroundings hospitable shows a prevalence of 70% of the illnesses diarrhéiques are of food origin, cause them are bound essentially to the bad conditions of transformation and the sale (Leclerc and al. 2002). This observation would be due to the lack of formation of the actors of the path on the rules of hygiene in the different markets. Is it therefore necessary to carry a particular attention on the formation of the saleswomen and the improvement of the hygienic quality of fish transformed in order to assure a better food security of the consumers.

References

[1]. **Abed Fouzia et Beloufa Fatiha 2019 :** Qualité nutritionnelle du Tilapia rouge (Oreochromis sp) nourri par deux aliments expérimentaux. Faculté des Sciences de la Nature et de la Vie p1.
[2]. **Anonyme, 2005** : Le poisson et la sécurité alimentaire en Afrique. Woldfish Center, Penang (Malaisie). p15.
[3]. **Djohra Nihad, Lafioune Hadjer, Nour Soumia**.2021 : Evaluation de la qualité des anchois salés marinés à l'huile d'olive vierge et aux feuilles de laurier. Algérie : 39p.
[4]. **Elyounoussi Charifa, Rachidi Abderrazzak, Belhassane Lala Hassnaa, Bekkali Mohammed, 2015 :** Evaluation de la qualité microbiologique de certains poissons capturés et commercialisés dans le grand Casablanca au Maroc. Volume 9, n°38, 46p.

[5]. **F. Oulaï, A. Koffi, M. Koussemon, C. Kakou, A. Kamenou**, Evaluation de la qualité microbiologique des poissons Ehtnialosa Fimbriata et Sardinelle auriata fumé traditionnellement, microbiologie et Hygiène alimentaire, (2007) 19 - 55
[6]. **Fao.** 2016 : la situation mondiale des pêches et de l'aquaculture. Contribution à la sécurité alimentaire. Rome. 224p.
[7]. **Fao**. **2018.** Le développement de l'aquaculture en Algérie en collaboration avec la FAO – Bilan 2008-2016. FAO, Circulaire sur les pêches et l'aquaculture no.1176. Rome. 112 pp.
[8]. **Fao.** Département des pèches Rome. 2020. La situation mondiale des pêches et de l'aquaculture. www.fao.org consulté le 08 janvier 2025.
[9]. **Leclerc, Schwarrtzbrod, Dei-Cas, 2002:** microbial agents associated with waterborne diseases. Crit. Rev. Microbiol., 28 : 371-409.
[10]. **Mires 1995:** Aquaculture and the aquatic environment: mutual impact and preventive management. The Israeli journal of aquaculture, 47,163-172.
[11]. **Outtara ,1986** : Etude de la qualité bactériologique des filets des poissons congélés. Thèse : Med. Vét., Dakar 20p.
[12]. **Rodier J., legube B., merlet N., 2009**: l'analyse de l'eau. 9eme édition. Dunod. Paris.1579p.
[13]. **Saidi fatiha 2018:** Evaluation de la qualité organoleptique et microbiologique de la sardine (Sardina plichardus) prélevée au niveau du port et du marché de la wilaya de Mostaganem. Thème réalisé au Laboratoire de Microbiologie N°2 SNV-U. Mostaganem p19
[14]. **Temgoua Tsamo Edouard, 2016** : contrôle de la qualité microbiologique des poissons congelés vendus dans les poissonneries de la ville de Yaoundé. Cas du maquereau (trachurus trachurus).49p.
[15]. **Untermann, 1998**: Microbial hazards of food. Food control, 9: 119-126.
[16]. **Who/fao, 1998:** Forty-ninth meeting of the joint expert committee on food additives. Food and agricultural organization of the united nation. Rome, 140p.

Webographie

[17]. Bd. https://www.bd.com/fr-fr.
[18]. https://bibirou1. Over-blog.com.