

Full Length Research Paper

Study of microbiological quality of the fermented drink "TCHAKPALO" consumed in Benin roads

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The Tchakpalo sold outskirts roads of Cotonou have been exposed to contaminations for the reason of that producers/sellers neglected hygiene regulations. The selling environment was often dirty because of the presence of insects, the nearing of residual gutters and puddles with unpleasant and invading odor mixed with exhausting gazes. Our research aims to study microbiological quality of Tchakpalo, a fermented drink. The results revealed presence of pathogenic microorganisms and worse hygienic indicators like the genera *Staphylococcus*, Coliforms and *Salmonella* which have been identified in many samples of Tchakpalo. The presence of these microbes constitutes a hazard for the consumers of Tchakpalo because of its sensitivity for microbe's proliferation in case of contamination could be considered as a hazardous food.

Keywords: Tchakpalo, road fermented drink, microbiological quality, Benin.

INTRODUCTION

Road feeding is defined as "foods and drinks ready to be consumed, cooked and sold by the sellers, merchants in ambulation, especially on the roads and other public places" and "foods and drinks cooked outside of home, sold by enterprises of informal sector to be consumed directly" (Chauliac et al., 1994). Road feeding was probably nowadays, one of activities sectors, the more providers of urban jobs in developing countries. It becomes an answer to poor urbanite people practices to a part for resolving the excellent town labor, and in another part for town feeding (Nago, 1992). In some developing countries cities, the party of

food conception outside of home can represent 20% of familial budget (Agbendech et al., 1996). However it's regrettable to observe that the nutritional and hygienically quality of these food products essential for many citizens, might be affected by bad conditions of cooking, of storing and distribution. Among these food products issued from local culinary property, the foods derived from cereals get a place of choice. In fact, the importance of cereals was in relation with multiple forms of transformation whatever in small-scale or industry. We can count about a hundred recipes made by cereals in Benin. The processing and trading of these products occupied more than 60% of the actors in agro food sector in southern Benin (Madode, 2003). Among food products derived from cereals was "Tchakpalo" or "Tchakparo" or "Tchapalo". This Tchakpalo is a fermented

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drink, cooked according to a traditional process which mainly contains a spontaneous fermentation step of a ground obtained from water and maize (*Zea mays*) or from mil (*Pennisetum typhoideum*) or from sorghum (*Sorghum sp*) sprouted or from the three mixed cereals sprouted. This latter become few alcoholized (in average $5.03 \pm 0.77 \text{g/L}$) according to Amane et al. (2005), presenting in general dark-brown color, pleasant flavor, and light sweeten and acid taste. Tchakpalo was daily life of Collins people (in Center of Benin). It takes a place of choice because of important number of women who devote to its production, selling it and participate to its distribution all along the country (Ategbo, 1984). It's a Beninese traditional drink and west-African one, refreshing and thirsting one, sold in the market and near activities areas. Since few years, atmospherically pollution targets of soil and water have been amplified in Benin Republic, in particular in main cities of Benin especially in Cotonou where during peak hours, the air was full of pollutants, and the gutters exhaled nausea bond gases mixing with dust made out by the pedestrians. Tchakpalo sellers unfortunately were at these places and sold their product without any care. This incites us to investigate that these environmental conditions might not get any influence on the quality of drink sold, as we know even the hotels were not aware from food hygiene problems (Addo et al., 2006). That is the question which makes us interest to microbiological quality of Tchakpalo sold around of Cotonou streets.

MATERIAL AND METHODS

Sampling

Samplings and investigations have been done in Cotonou with producers/sellers of Tchakpalo. The study material used was Tchakpalo sold by four fixed sellers, well identified, established in four areas of the economic capital of Benin, which is Cotonou city.

These areas had been selected relating to the high density of population and that population lived in bad environmental conditions, notably near gutters free-opened.

The sellers were named:

- The seller A of Tchakpalo localized in front of Jericho post office.
- The seller B of Tchakpalo localized near Media Production cross-roads of Kouhounou.
- The seller C of Tchakpalo localized in front of the free-opened gutter which was at the Bicentenary Place
- The seller D of Tchakpalo localized inside Dantokpa market on the road in front of Diamond Bank.

The sampling of Tchakpalo had been done aseptically, inside sterile bottles. Six units had been sampled on

each seller in the following order: the first sample had been taken just the time the seller arrived and filled her pot, around 9.o'clock a.m.

The five other samples have been taken each in the interval of, one hour as though the last one has been taken around two o'clock p.m. Each seller has been sampled there times, thus we have to analyze 72 samples.

Inquiries about sellers

To obtain more information about preparation, storage and Tchakpalo selling conditions, inquiry questionnaire on producers and sellers had been elaborated. The inquiries had been performed on the women who have constituted study sampling and this simultaneously with the sampling.

Microbiological analyses

The culture methods described by the standards ISO 4833, ISO 7954, ISO 4831, ISO 7252, NF V04-503 modified, ISO 7037 and ISO 6579 have been respectively applied for the aerobic flora, the moulds, the research of Coliforms, Staphylococci, Lactobacilli, Sulfite-reducing, Clostridia and Salmonella

RESULTS

Information collected during inquiries had shown that four of the sellers were housewives. These latters had stopped study in primary level. The raw materials used by the Tchakpalo producers/sellers of Cotonou could be gathered in two groups: the sellers B, C and D used maize, tap water, powdered sugar, guissin (fermented maize water) and honey whereas the seller A used in addition of maize, tap water, powdered sugar, the guissin, the honey. Manufacture process varies very little (in south) in Cotonou and was practically similar to the Tchakpalo of urban areas previously described (Figure 1) by Ategbo (1984).

The counting results of the mesospheric aerobic flora had permitted to draw the curves of figure 2. These curves showed that during the preparation, we mean at the sellers arrival outskirts of the roads, the drinks contains a minimum of 6.10^8 cfu/ml (Tchakpalo B) and this number varied in function of time to reach 375.10^8 cfu/ml (Tchakpalo C). Moulds count results and those of yeasts had allowed respectively to draw curves of figure 3 and 4 traducing their evolution in function of time. These curves showed that all drinks contained yeasts susceptible to be in their majority responsible of Tchakpalo fermentation. The figure 4 shows the

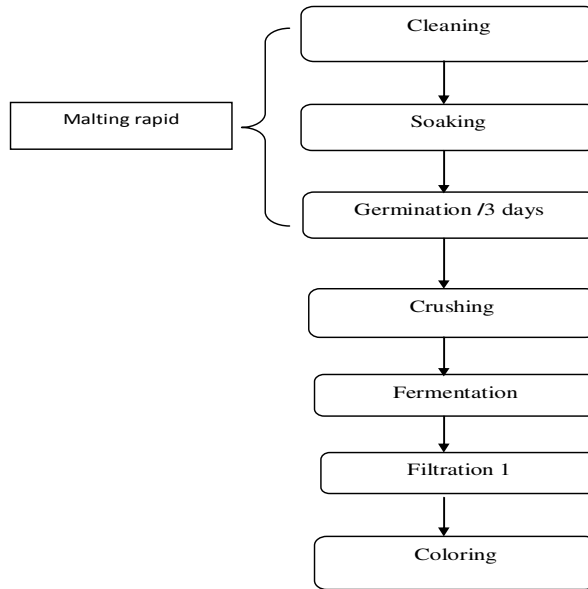


Figure 1. Technology in urban areas (Ategbo, 1984)

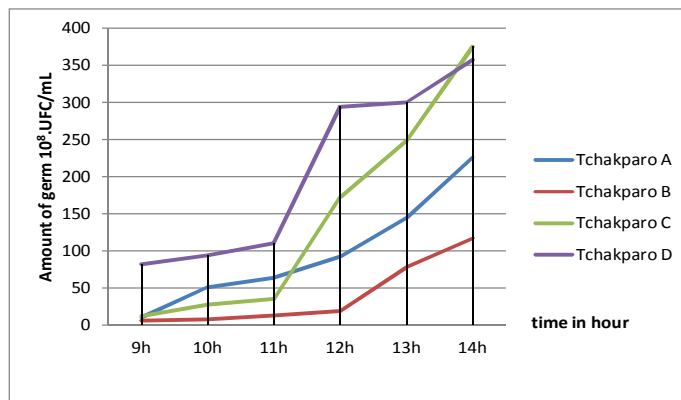


Figure 2. curves traducing total mesospheric aerobic flora of Tchakpalo in function of time

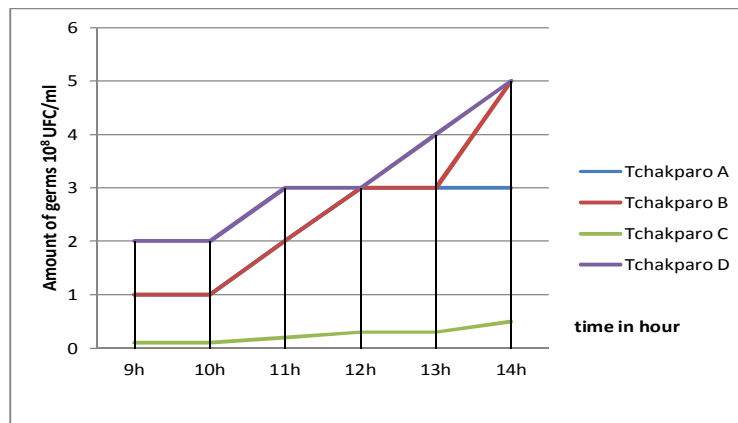


Figure 3. Curves traducing moulds number inside Tchakpalo in function of time

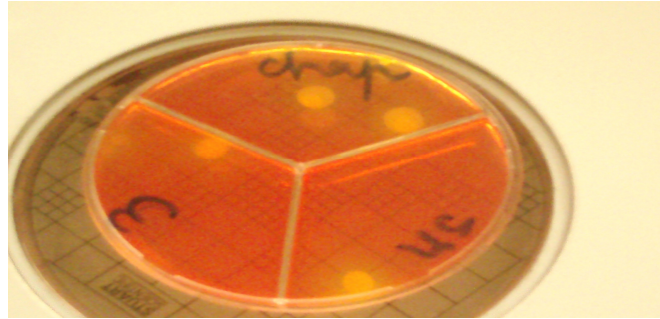


Figure 4. Petri dish with a few colonies of staphylococci on medium Chapman

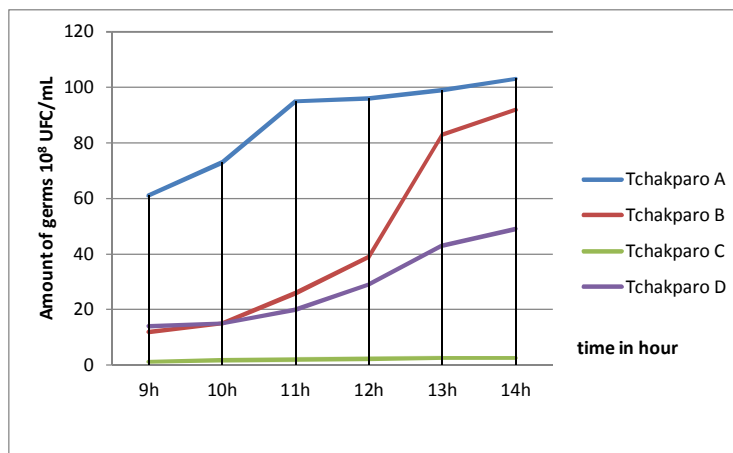


Figure 5. Curves traducing number of yeasts inside Tchakpalo in function of time

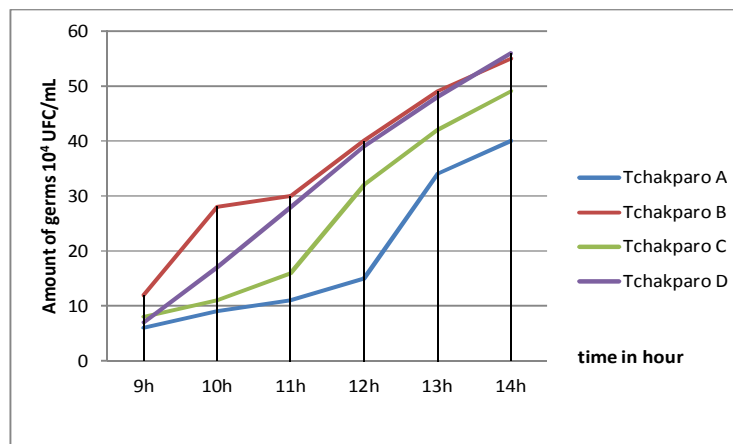


Figure 6. Curves traducing number of Lactobacilli inside Tchakpalo in function of time

growth of Staphylococcus. The Lactobacilli count had allowed drawing the curves of the figure 6. These

curves showed that all the samples contained lactobacilli and their number rose in function of time.

The sulfite-reducing anaerobes were absent in all samples taken when some of samples contained *Salmonella*, coliforms and *E. coli*.

DISCUSSION

Results of analyses concerning fungal flora had allowed noticing this flora was present in all samples with a considerable presence of yeasts relating to the moulds.

These yeasts might come from the guissin responsible of the fermentation. The number of fungal flora up to the standards one which was comprised between 10^4 and 10^6 cfu/ml for industrial beer (Guirand, 1980).

Staphylococci count had showed Tchakpalo C was dirtier than Tchakpalo D, this one also more than the Tchakpalo B followed by the Tchakpalo A which contained a minimum of 4.10^4 cfu/ml. these numbers were in contradiction with the results obtained by Legbassi (2005) in Porto-Novo and in accordance with the one obtained by Oussou (2006) in Cotonou.

Concerning coliforms, we noted the presence of total coliforms in $\frac{3}{4}$ of samples and some thermotolerants (including *E. coli*) in the half of samples. The rates were strictly up to standards which required their total absence (Guiraud, 1980). Hands convey most of the time these seeds of fecal contamination that are often responsible for diarrheal diseases and gastrointestinal. This has already been proven by several studies (Owhe-Ureghe and al., 1993; Tjao and al., 1997).

Lactobacilli count had showed this fermentative flora were high in the four samples. This strong rate of lactobacilli was in relation with Tchakpalo acidity notified by Amane et al. (2005) works. The results of these studies corroborate those of Alais (1984) and Topisirivic (2006) according to which of the lactic acid bacteria, *Lactobacillus* are the most acidifying and more resistant to acidification (pH <3.2). These lactic acid bacteria were also isolated during the traditional fermentation of many food products (Buckenhüskes, 1993; Savadogo et al., 2004a, b). The *Salmonella* had been identified in the sample taken near the gutter in bicentenary place. This is contrary to the microbiological criteria of the French Association for Standardization established by the decree of March 30, 1994 (Leyral and Vierling, 2001) which prescribed their total absence in consumed products. From the interpretation of these results, we can say that the method of Ishikawa also called "theory of 5M" is not at all applied in the manufacture of tchakpalo which justifies the high contamination observed. Thus, the presence and increased of different microorganisms in function of time were the resultant of multiple crossed contaminations occurring in the production chain, since raw materials till the selling method of Tchakpalo,

including preparation, storing and the selling place environment.

These contaminations could arise from many sources particularly the raw materials used for Tchakpalo preparation in Cotonou. First of all, the maize contains spores of microorganisms when the grains were not well selected and cleaned. The second source could be the water for which the use was still a doubt, which could be contaminated when transported through out basins or opened buckets (Tchoukpa, 2002). This was evident when it had been reported that some mineral water bottles contained mesospheric aerobic flora (Osseni, 2003). Another source of contamination could be the powdered sugar of which microbiological quality and its real utilization were not confirmed. Fermented maize water (guissin) was micro flora tank (in particular moulds) used in addition with caramelized sugar by the producers to prepare directly Tchakpalo. For customers nearing, these sellers established on the crowd, near main roads where the gutters let free nauseating odors which mixed to the dust of pedestrians and the motorcycles and cars exhaust gazes.

The immediate environment occurred constitute a transferring medium of microorganisms spores. These popular areas furthered other forms of contaminations by insects, particularly butter flies and bees, air spores and microorganisms rejected in the air by coughs and sneezes. Selling conditions consisting in serving all customers with the same cups cleaned in one or two water crush facilitated Tchakpalo contaminations by the mouth alliterated flora. Coinces exchange between buyers and sellers were done by the same hands which serve. It's clear that these coinces of money also contributed to over infect the Tchakpalo, in particular vectors of Staphylococci and coliforms.

CONCLUSION

This study based on the assessment of microbiological quality of Tchakpalo consumed in Cotonou roads had permitted us to show that microbiological quality of Tchakpalo were not maintained after preparation and could be a major source of food toxic-infections. The preparation method of Tchakpalo, the environment and the way of selling are responsible of Tchakpalo contamination. It might be important to confirm these results, by studying microbiological quality of raw materials used for its preparation before their utilization.

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