International Journal of Applied Science and Engineering Review

ISSN: 2582-6271

Vol.2 No.2; Mar-Apr 2021

PHYSICAL-CHEMICAL AND BACTERIOLOGICAL STUDY OF PALM WINE PRODUCED AND CONSUMED IN KISANGANI IN 2016 "CASE OF THE COMMON TSHOPO" IN RD CONGO

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ABSTRACT

In our country the Democratic Republic of Congo, palm wine is among the most consumed beverages. This commodity is growing in terms of consumption and especially in the Province of Tshopo, especially in the city of Kisangani due to its lower blow and its availability especially for low-income populations.

Our study focused on "The Physico-Chemical and Bacteriological Study of Palme Wine Produced and Consumed in Kisangani."

The analyses carried out showed that the palm wine sold in Kisangani in the Tshopo commune is extracted in an artisanal way and marketed without any microbiological and physical-chemical control. As a result, it is contaminated with germs that are harmful to health and certain physical and chemical parameters are modified.

Total flora is counted in all samples (100%). Yeasts at 33% while Staphylococci are counted at 67% sample. The number of FMAT colonies. Yeasts and Staphylococci counted in wine samples from shooters varies between 1, 82. 10^5 to 1.86.10^5 with an average of 1.84.10^5 Ufc/ml of wine from 0 to 10 with an average of 3.33 Ufc/ml of wine and 0 to 620 with an average of 213, 33 Ufc/ml of wine.

While the number of colonies of FMAT yeasts and Staphylococci counts in wine samples from sellers varies between 1.81.10^5 to 1.86.10^5 with an average of 1.84.10^5 Ufc/ml wine from 0 to 650 with an average of 28.33 Ufc/ml of wine and 180 to 1400 with an average of 696.66 Ufc/ml of wine

KEYWORDS: Physio-chemical study; Bacteriological, Palme wine, Product, consumed, city of Kisangani.

1. INTRODUCTION

In the developing country, palm sap is not only a source of certain nutrients as reported by N'SASI (1968) but also a source of income, although production is still artisanal, i.e. without adequate stabilization for

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this drink called "Palm Wine".

The development of the conservation and/or processing processes of this sap may offer new opportunities to encourage on its production, something that is not yet done in our country despite the industrial chemistry options that there is a better method of production and conservation on an industrial scale is not yet developed as is the case in other countries such as Cameroon and other countries of Africa and America (www.lefaso.net. March 17, 2015. 09: 52).

Palm wine being a naturally fermented alcoholic beverage is influenced by some factors that we will list below.

As a food item, palm wine is required to undergo organoleptic examinations or analyses to reassure themselves of its compliance to be consumed and to physical and chemical analyses to reassure themselves of these qualities; something that is not done on this drink, thus making it a way by which consumers can contaminate diseases (KAZADI 2013).

Unlike some previous work such as that of LUKUMBA (Chemistry and Agricultural Industries "CIA" 1978) on the influence of stabilization and conservation operations on the number of micro-organisms of palm wine with the aim of studying the influence of certain physical treatments (filtration, pasteurization and combination, concentration-pasteurization) applied or palm wine; KABAMBA (CIA 1978) on the balance of nitrogen materials during palm wine stabilization and conservation operations: MBUSA (CIA 2003) on the assessment of the chemical and organoleptic characteristics of palm wine during its conservation by applying certain pasteurization treatments, sugaring and salting): like MO (CIA 2008) on obtaining vinegar from fermented palm sap and determining the influence of pasteurization treatment coupled with or not coupled with leverage and/or sugaring on the quality of wine and vinegar: ours rather on the physical-chemical and microbiological study of palm wine produced and sold in Kisangani.

This wine which suffers not only the influence of light, temperature and preservation, but also and above all the addition of water to increase the quantity not taking into account the change in its qualities that can always be harmful on the health of the ignorant consumer.

Palm wine being a naturally fermented drink is influenced by temperature, sugar concentration and the amount of yeast. There are conservation problems that could lead to the transformation of wine into vinegar and also to the contamination of the wine by the undesirable flora present in the sap and also by the flora brought by the outside world as a result of the way this wine is stored and the flora brought by the water added to it.

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OBJECTIVE

The general objective of this work is to assess the physical-chemical and bacteriological quality of palm wine produced and sold in the Tshopo commune; Kapalata district on the right bank of the Tshopo River in Kisangani, DRC.

The specific objectives are:

- ✓ Determine the ph, the degree brix. The alcohol level and density.
- ✓ Isolate and count yeasts, total germs and staph found in this drink.

II. METHODOLOGY

In our research, we conducted a cross-sectional study based on the experimental method, which method allowed us to achieve our goal.

The techniques of analysis, treatments and counting also allowed us to achieve the result.

1. Taking samples

The palm wine that forms the sample of our analyses was purchased and we quickly took it to the biotechnology laboratory of the Faculty of Science of the University of Kisangani first and then to that of the Congolese Office of Control (OCC) where these were analyzed.

2. Preparing samples

Since it was necessary to research and count the floras likely to contaminate the wine, the preparation at the Laboratory consisted of a dilution of 1/10: it is to collect 5 ml of wine and add 45 ml of tamponed peptonated water (EPT). The contents of the balloon are homogenized and left to rest for 30 times at room temperature to ensure the revitalization of microorganisms, the resulting solution is the mother solution (10-1).

3. Count of Flore Mesophile Total Aerobics (FMAT)

Total aerobic mesophilic flora has been counted in a solid PCA medium using the coating technique. Serial dilutions must be done first. To do this, 1 ml of the mother solution is taken using a sterile syringe and then poured into a tube containing 9 ml of physiological water, or homogenizes the solution by suction backing up 3 times with a new syringe. Then 1 ml of this tube is removed and put into a second tube and or discarded the syringe and so on until the fourth tube.

To suck the 1 ml of inoculum back into the empty petri dish, use a single syringe starting with the

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dilution$^{10-2}$ richest in microorganisms so restart the 1 ml inoculum of each dilution to the leap of each empty box previously identified.

Then:

- Pour about 15 ml (3mm thick) of agar in a fusion 45oC
- Well homogenize by rotational motion in 8
- Leave to solidify on the mat
- Turn the boxes over once solidified and incubate them at 30oC in the oven for 48-72 hours.

Reading and interpretation: counting colonies if the is countable and calculating N to determine whether or not it is compliant for consumption

4. YEAST COUNT

This count consisted of:

- ✓ Take 1 ml of the mother solution inoculate in the sterile petri dish,
- ✓ Pour the sabourand agar and homogenize by rotating in 8 then let it solidify at room temperature,
- ✓ Turn the box over once solidified and incubate at 37 degrees C for 48 hours.

5. COUNTING STAPHYLOCOCCI

This count consists of:

- ❖ Take 1 ml of the mother solution, incubate in the sterile petri dish.
- ❖ Pour the Chapman agar and homogenize by rotating in 8 then let it solidify at room temperature
- ❖ Turn the box over once solidified and incubated at 37 degrees C for 24-48 hours.

Thus, to prevent the colonies from being poorly visualized and not allowing reading, the petri dishes must be toppled in the incubator. Even if steam occurs as a result of the temperature of the incubator, the little water produced can be stored in the lid instead of stored in seeding.

The results were calculated using the following formulas:

- For FTTMs. $Nc\,(c)\,\frac{\sum c}{v\,(ns+(01\;n2))d}$
- ForAT FM. $Nc\,\frac{n1+n2}{2}x\frac{1}{fd}$
- For staphylococci $Nc\,\frac{n1+n2}{2}x\frac{1}{fd}$

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Legend

- ✓ Nc: Number of colonies
- ✓ N1: Number of colonies in the first box (n1)
- ✓ N2: Number of colonies in the second box (n2)
- ✓ V: Withdrawal volume
- ✓ 01 : Constance
- ✓ d: Dilution volume
- ✓ ∑c : La sum of the colonies (n1 - n2)
- ✓ fd: Fd dilution function - 10^{-1}
- ✓ Ufc/ml: Colony-by-milliliter unit.

III. RESULTS

III .1. The microbiological qualities of the wines studied

The results of our study on microbiological qualities are presented in Tables I, II and III below:

Table I: The load of germs in Ufc/ml of fresh palm wine (at the shooter).

Levies	Name of FMAT	Yeast numbers	Number of Staphylococcus
P1	1.86. 10^5	0	20
P2	1.84. 10^5	0	620
P3	1.82. 10^5	10	0
Average	**1.84. 10^5**	**3.33**	**213.33**

The results of the analysis in Table I show that flora is counted in all samples (100%). Yeasts are counted at 33% while staphylococci is counted at 67% of samples. The number of FMAT colonies. Yeasts and staph counted in wine samples from shooters ranged from 1.82.10^5 to 1.86.10^5 respectively with an average of 1.84.84.5 10^5 Ufc/ml of wine from 0 to 10 with an average of 3.33 Ufc/ml of wine and 0 to 620 with an average of 213, 33 Ufc/ml of wine.

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Table II: The load of germs in Ufc/ml of wine from Seller I

Levies	Name of FMAT	Yeast numbers	Number of Staphylococcus
P1	1.812. 10^5	475	970
P2	1.89. 10^5	247	400
P3	1.811. 10^5	20	80
Average	**1.83. 10^5**	**247.33**	**483.33**

The table notes that total flora and staphylococcus are counted in all samples (100%) while yeasts are counted at 33% of samples; the number of FMAT yeast and staphylococcus colonies counted in wine samples from Seller I varies between 1,811.10^5 and 1.89.10^5 respectively with an average of 1.83.10^5 Ufc/ml wine: 20 to 475 with an average of 247.33 Ufc/ml of wine and 80 to 970 with an average of 483.33 Ufc/ml of wine.

Table III: The Load of Germs in Ufc/ml of Seller's Wine II

Levies	Name of FMAT	Yeast numbers	Number of Staphylococcus
P1	1.84. 10^5	200	510
P2	1.81. 10^5	650	1400
P3	1.87. 10^5	0	180
Average	**1.84. 10^5**	**283.333**	**696.66**

We observe in Table III that total flora and staphylococci are counted in all samples (100%), while yeasts are counted at 67%. The number of FMAT colonies. Yeasts and staphylococci counted in wine samples from seller 2 ranges from 1.81.10^5 to 1.86.10^5 respectively with an average of 1.84.10^5 Ufc/ml of wine from 0 to 650 with an average of 283.33 Ufc/ml of wine and 180 to 1400 with an average of 696.66 Ufc/ml of wine.

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III.2. The physical-chemical characteristics of palm wines studied

The results of the characteristics of the palm wines studied are presented in Tables IV, V and VI.

Table IV: The PH of palm wine in all three types of samples

Levies	Fresh wine	Wine V1 (seller 1)	Wine V2 (seller 2)
P1	4.39	4.34	4.31
P2	4.23	4.07	4.0
P3	4.9	4.21	3.2
Average	**4.506**	**4.2066**	**3.8366**

Table IV shows that the PH is 4,506 in fresh wine, 4.2066 in seller wine I and 3.8366 in seller wine II. According to the latter (1993). The PH of stabilized palm wine ranges from 3.5 to 4.5. Our results are up to standard.

Table V: The brix degree of palm wine

Levies	Fresh wine	Wine V1 (seller 1)	Wine V2 (seller 2)
P1	8.75	7.7	4.65
P2	11.1	7.6	3.6
P3	8.4	5.9	5.3
Average	**9.4166**	**7.066**	**4.5166**

Table V shows that the brix degree of fresh wine or the shooter is high with an average of 9.4166 brix in the wine of seller I (V1) the average is 7,066 brix and in that of Seller II (V2) it is 451.66 brix. Seller II's wine has a lower brix degree than that of Seller I and even less than that of the shooter.

This is justifiable by the fact that palm wine, being a naturally fermented alcoholic beverage. It is thus influenced by certain factors mentioned above and this leads to this difference. It is clear that the more time passes the lower the brix degree and the alcohol content increases.

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This correlation is explained by the fact that yeasts consume sugar and by turning into alcohol, which is why the more naturally sweetened this wine is, the less alcoholic it is and the less sweet it is, the more alcoholic it is.

Table VI: The Alcohol or Alcohol Content of Palm Wine

Levies	Fresh wine	Wine V1 (seller 1)	Wine V2 (seller 2)
P1	1.42	3.23	3.93
P2	2.21	3.1	4.30
P3	1.11	2.30	3.88
Average	**1.58**	**2.876**	**4.036**

Table VI shows that the alcohol content of palm wine samples from shooters ranges from 1.11% to 2.21 with an average of 1.58%. This content varies from 2.3 to 3.23% with an average of 2.587% while after 24 hours the content varies from 3.88 to 4.3% with an average of 4.036%.

Table VII: Microbiological criteria for wine (Raymond Dumay 2006).

Microorganisms	Number of microorganisms/ml
Total mesophile aerobic flora	$\leq 5.10^4$
Pathogenic staphylococci	≤ 100
Yeasts and moulds	≤ 10

We used the criteria of the French decree of 21 December 1979 repealed by regulation C.E 2073/2005 which has been applicable since 1 January 2006 to interpret the results of germ analyses: quantitative criterion. That is, m as a microbiological criterion set with a threshold value of acceptability (plan to 3 classes).

- Results of 10 m less than 10 m in solid environment: satisfactory product,
- Results between 10m and 30m in liquid environments and 3m and 10m in solid environments. Acceptable product.
- Results greater than 10 m in solid environment or 30 m in liquid environment: unsatisfactory product.

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Table VIII: interpretations of bacteriological results by wine type in%

Wine	Satisfactory		Acceptable		Unsatisfactory	
	Sample number	%	Sample number	%	Sample number	%
Shooter	0	0	3	100	0	0
Seller 1	0	0	0	0	3	100
Seller 2	0	0	0	0	3	100

These results show that palm wine is of good microbiological quality among shooters, but this microbiological quality of wine is deteriorating in sellers. This microbiological degradation or proliferation that even affects the quality of the wine could be explained either by the quality of the non-potable water that the sellers add after buying from the shooters in order to increase the quantity, or by the quality of the storage container or the bowl used to serve customers.

Degradation is also observed in wine samples kept for about 24 hours by sellers. This degradation was amplified by poor conservation methods.

Table IX: Biological stabilization of the palm wines studied.

Type of wine	Number of yeast per ml	Wine quality
Shooter	3.33	Acceptable wine as part of a short marketing circuit
Seller 1	247.33	Clear wine with unstable gloss risks microbial alteration
Seller 2	283.333	Clear wine with unstable gloss risks microbial alteration

The results as observed in this table shows that the palm wine that was the subject of this study is not stable in shooters, it is acceptable in the context of a short marketing circuit and the same wine among sellers, it is clear to shiny unstable risk of microbial alteration. This could be explained by the fact that palm wine has not undergone any treatment and is not pasteurized.

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IV. DISCUSSION AND CONCLUSION

Our research showed that in all samples analyzed, there were the presence of germs of contamination as total aerobic mesophilic flora that are harmful to health and that certain physical-chemical parameters undergo changes.

Yeasts were counted at 33% while staphylococci was 67% of samples analyzed.

The PH was 4,506 in fresh wine 4.2066 in Seller's Wine I and 3.8366 in Seller's Wine II. According to Dornier (1993) the PH of stabilized palm wine ranges from 3.5 to 4.5. Our results are thus in line with the standards.

As for the brix degree, it was found that the brix degree of fresh wine or the shooter is high and that it was lower in the sellers' wines. And it was found that this difference was due to the fact that the more time passes, the lower the brix degree and the alcohol content increases.

The alcohol content in fresh or shooter wine is low (1.11% to 2.2) with an average of 1.58% and that within 24 hours this content can range from 3.88 to 4.3% with an average of 4.036%.

The literature of palm wine production has shown that as soon as it comes out of the palm tree, the fermentation of the wine begins. It is 0 and 2 degrees on the first day and 2 days after palm wine can reach 4 degrees.

This concentration would be improved if winemaking is done under ideal fermentation and storage conditions (http//www. Multinania.fr/delinany/vins.html).

Our results show that the variation in the average alcohol content depends on the duration of fermentation. However, there is an increase in this content. This suggests that an increase in fermentation time could cause this palm wine to pass into the standard alcohol content. The increase in this content could be approved by the addition of certain substrates.

Manya (1996) demonstrated an increase in the content of the traditional drink "Lotoko" by the addition of sucrose.

Safari (2010) conducted a study on winemaking by combining 5 different types of fruit.
The densities found in our analyses show that the fresher this wine is, the denser it is and when the shelf life increases the wine becomes less and less dense.

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