MICROBIOLOGICAL QUALITY OF PALM WINE (*Elaeis guineensis* and *Raphia hookeri*) SOLD WITHIN ABA METROPOLIS, ABIA STATE, SOUTH EASTERN NIGERIA

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ABSTRACT

Palm wine has several nutritional, medical, religious and social uses which have been reported to have increasingly enhanced the demand for this natural product. However, the sap undergoes spontaneous fermentation, which promotes the proliferation of microorganism due to its nutritional content. In the present study, the microbiological quality of different palm wine samples was investigated, the result revealed that the drink harboured several species of microbial genera which include *Staphylococcus*, *Lactobacillus, Micrococcus, Serratia, Bacillus, Streptococcus, Saccharomyces cerevisae*, and *Candida tropiclis*. The heterotrophic bacteria and total fungal count ranges from $1.0 \times 10^4 - 2.0 \times 10^4$ and $1.6 \times 10^4 - 4.2 \times 10^4$ respectively for the different samples. The presence of these microbial populations in the drink is of public health importance considering the specific role of the organisms and the increasing demand for the product by people in the area studied. The present study therefore aims at investigating the rate of microbial contamination associated with the consumption of palm wine so as to create public awareness on the risk factor involved and the need for proper sanitary hygienic practice during the processing and distribution of this product.

Keywords: Elaeis guineensis, Raphia hookeri, Palm wine, Microbiological, contamination.

INTRODUCTION

Palm wine is generally referred to as a group of alcoholic beverages obtained by fermentation of the saps of palm trees (Agu *et al*, 1999). It is consumed throughout the tropics and appears as a whitish liquid produced by natural fermentation of the sap of *Elaeis guineensis* and *Raphia hookeri*. The unfermented sap is clean, sweet, colourless syrup containing about 10 - 12% sugar, which is mainly sucrose. It is a refreshing beverage widely consumed in south eastern Nigeria and other parts of the world particularly Asia and Southern America. Although palm wine may be presented in a variety of flavours, ranging from sweet (unfermented) to sour (fermented) and vinegary, but is mostly enjoyed by people when sweet (Elijah *et al.*, 2010).

Upon fermentation by the natural microbial flora, the sugar level decreases rapidly as it is converted to alcohol and other products (Obire, 2005), whereas, the sap becomes milky-white due to the increased microbial suspension resulting from the prolific growth of the fermenting organism. Palm wine is characterized by an effervescence of gas resulting from the fermentation of the sucrose content by the fermenting organisms. Previous studies on the microbiology of *E. guineensis* and *R. hookeri* have incriminated several bacterial and yeast flora to be involved in the fermentation process (Ejiofor, 1994; Nester *et al.*, 2004). These organisms have also been reported to originate from several sources, which include tapping equipment, containers, the environment, etc.

Generally, both brands of palm wine have several nutritional, medical, religious and social uses which have been reported else where (Iheonu, 2000), to have increasingly enhanced the demand for this natural product. Although attempts have been made towards the preservation and shelf-life extension of palm wine through bottling, use of chemical additives and addition of plant extracts have greatly affected the organoleptic quality of the product (Orimaiye, 1997; Iheonu, 2000; Nwokeke, 2001; Obire, 2005). The present study aimed at evaluating the microbial quality of some locally sold Palm wine within Aba Metropolis, Abia State.

MATERIALS AND METHOD Sample collection

Five fresh palm wine samples (*E. guineensis* and *R. hookeri*), (labeled A - E) were separately collected from local palm wine tappers from Aba metropolis, Abia State Nigeria. The freshly tapped samples were collected using pre-sterilized labeled 100 ml capacity sample bottles with perforated screw caps. The samples were transported to the laboratory in a cooler pack of freezing mixture of salt and ice-block for analysis within 1 hour of collection to reduce fermentation rate considerably. (Bassir, 1962 and Obire, 2005)

Microbial isolation and succession in palm wine

1 ml aliquot of each palm wine was taken aseptically and serially diluted up to 10-fold using 0.1% (w/v) bacteriological peptone. 1.0 ml dilutions were plated out in duplicate using spread plate method according to Cheesbrough, (2000) on Nutrient agar (Oxoid) for total heterotrophic bacterial count, Mac-Conkey agar (Oxoid) for the total coliform count and Sabouraud dextrose agar (Oxoid) containing 0.05 mg/ml streptomycin for yeast count. The inoculated plates were incubated aseptically at 30°C for 24 h for bacteria and 24 - 48 h for the yeast. Subcultures of discrete colonies were made and were stored on agar slants for characterization.

Chacterization of isolates

RESULT

The Isolates were grouped accorded to their colonial morphology and cell characteristics. Isolates were thereafter subjected to biochemical tests as described by Collins and Lyne (1984) and Ogbulie *et al.*, (1994). The probable identities of the isolates were as described by Cheesbrough, (2000).

TABLE 1. Total lungi count and Total bacteria count (cru/nn) in pain white samples.										
Sample	Total fungi count	Total bacteria count								
A	$3.6 \ge 10^4$	$1.2 \ge 10^4$								
В	$4.2 \ge 10^4$	$2.0 \ge 10^4$								
С	$2.5 \ge 10^4$	$1.1 \ge 10^4$								
D	$2.0 \ge 10^4$	1.3×10^4								
E	$1.6 \ge 10^4$	$1.0 \ge 10^4$								

 TABLE 1: Total fungi count and Total bacteria count (cfu/ml) in palm wine samples.

Key: cfu/ml = colony forming unit per ml.

The table shows the total fungal and bacteria count in palm wine samples sold in Aba metropolis, Abia state. Sample B had the highest microbial contamination (4.2×10^4 and 2.0×10^4) while sample E had the least contamination (1.6×10^4 and 1.0×10^4).

Fable 2: Gram's and Bioche	emical Characteristics	of Bacteria Isolates	from Palm Wine sample.
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Colonial	Gram	Indole	Coagulase	Citrate	Spores	Oxidase	Lactos	Sucrose	Glucose	Isolate	
morphology	reaction						e				
Smooth entire margin round	+ve cocci in cluster	-	+	-	-	-	A/G	А	AG	Staphylococcus Species	
With metallic Sheen in EMB small smooth	+v rod	-	-	-	-	-	А	А	A	<i>Lactobacillus</i> Species	
Round and yellow colonies on N.A							-	А	-	<i>Micrococcus</i> species	
Round Mucoid	+ve	+	-	+	+	-	-	А	А	Serratia species	
Raised, irregular wits colonies	+ve rod	+	-	+	+	-	G	А	AG	Bacillus species	
Small colourless colony	+ve cocci in chains	-	-	-	-	-	А	-	AG	Streptococus	

Key: A = Acid, G =Gas, + = Positive, - Negative, N.A. = Nutrient agar, EMB = Eosine Methylene Blue

The table shows the Gram and Biochemical characteristic of bacteria isolates from the palm wine sample. A total of six bacteria isolates were identified which included strains of the genera *Staphylococcus* Species, *Lactobacillus, Micrococcus, Serratia, Bacillus,* and *Streptococcus* species.

Isolates	Cultural	Morphological	Probable fungi
A	Colonies grow rapidly. They	Typical multilateral budding,	Saccharomyces cerevisae
	are flat, smooth, moist	presence of pseudohyphae	
	glistering and cream to tannish	(rudimentary). Hyphae is	
	cream in colour	absent and oval in shape	
В	Colonies grow rapidly with	Forms pesudohyphae after 3	Candida tropicalis
	smooth moist glistering	hours of incubation with human	
	medium blue to dark metallic	serum. Irregular in shape	
	blue with a blue hallow		

Table	3:	The	cultura	al and	l morn	hol	ogica	l chara	cteristic	s of t	he fun	gi (v	east) i	isolates	s from	Palm	Wine	Sam	oles
					r		- -					8- V							

The table shows the cultural and morphological characteristic of fungi isolate from the palm wine samples. A total of two fungal isolates were identified in the samples which included *Saccharomyces cerevisae* and *Candida tropicalis*.

DISCUSSION

Throughout the world alcoholic drinks are made from the juices of locally grown plants including coconut palm, Palmyra and wild date palm. The term toddy and palm wine are both used to describe similar alcoholic drinks. The terminology varied from country to country (Chandrasekhar *et al*, 2012). In Nigeria, the common source of Palm wine is *Raphia rinfera*, *Raphia hookeri* and *Elaeis guineensis*. The sap is usually collected from a growing palm. This is done by tapping the palm and this involves making a small incision in the bark about 15cm from the top of the trunk. A clean gourd is tied around the tree to collect the sap which runs into it.

Generally, both brands of palm wine have several nutritional, medical, religious and social uses which have been reported else where (Iheonu, 2000), to have increasingly enhanced the demand for these natural products. The sap of the palm trees, which is originally sweet (Ogbulie *et al*, 2007; Amoa-Awua *et al.*, 2007; Naknean *et al.*, 2010; Santiago-Urbina *et al.*, 2013) serves as a rich substrate for the growth of various types of microorganisms soon after the sap is collected and within an hour (or) two becomes reasonably high in alcoholic content (up to 4%). If allowed to continue to ferment for more than a day, it starts turning into vinegar. The sap undergoes spontaneous fermentation, which promotes the proliferation of yeasts and bacteria for the conversion of the sweet substrate into

several metabolites mainly ethanol, lactic acid and acetic acid (Amoa-Awua *et al.*, 2007; Stringini *et al.*, 2009; Ouoba *et al.*, 2012; Santiago-Urbina *et al.*, 2013).

In the present study, the microbiological quality of palm wine from two different sources was investigated, the result showed that the palm wine sample harboured several strains of microorganism which may be as a result of the poor hygienic condition involved in the tapping, collection and distribution of the wine. However, Obi *et al.*, (2015) also reported the presence of similar organisms in palm wine sample from Ikwuano local government area of Abia State. Karamoko *et al.*, (2012) also reported the presence of yeast and other bacteria isolate from palm wine sample. However, according to Ogbulie (2007), the methods of palm wine tapping and collection of palm sap influence the microbial content of the sap.

The presence of these organisms in the wine is an indication of the poor hygienic state of the tappers, materials used and the method of tapping involved. This occurrence is of public health importance as the wine is consumed in almost every part of the country due to its nutritional, health and social significance. There is therefore the need for public awareness in the consumption of these wines to help promote the quality of these products as well avoiding the health risk that may be associated with the consumption of contaminated palm wine.

CONCLUSION

Palm wine and its distillate are important solvent in herbal medicinal administration. Pregnant women consume it fresh for the sweetness and nutrition while nursing mothers drink it warm to enhance breast milk production. In addition, majority of people drink palm wine during social activities and other ceremonies. The presence of these organisms in the samples as identified in the present study is of public health importance, if not properly handled. Therefore, there is need to promote the quality of these products to enhance their nutritional and health benefits as widely consumed in this part of country.

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