NUTRITRIONAL STATUS OF PROCESSED PALM WINE OF ELAEIS GUINEESIS FROM TWO DIFFERENT SOURCES IN NIGERIA

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ABSTRACT

The Palm wine is drunk by over 50,000 people in Nigeria in social gatherings, at home and in farms for refreshment. This paper is presenting some of the nutritional contents of the processed palm wine from two states of Nigeria whose palm were grown under different environments. The processed bottled oil palm -wine were randomly selected from two different locations in Nigeria. The samples were analysed for nutritional contents using standard methods. The concentrations of the elements were determined by atomic absorption spectophotometric methods. Significant differences were observed between the nutrients detected in both samples, which may be traceable to the soil profiles and climatic conditions of the zones where the palms were grown. However, the overall results revealed that the nutrients assayed were present in both samples, with the main station samples richer than the sub-station samples. For example, the ranges of some of the nutrients in the samples are as follows: % sucrose,7.00 ± 0.20 - 12.00 ± 0.10(NIFOR) and1.50 ± 0.00 - 6.00 ± 0.10(Umuabi); protein(mg/100ml) 0.05 ± 0.00 - 0.09 ±0.00(NIFOR) and 0.01± 0.00 - 0.03±0.00(Umuabi). Additionally, most of the nutrients detected have been reported as capable of playing significant roles in human health.

Key words: Elaeis guineensis, Nutritional status, Environmental factors and Health.

INTRODUCTION

Though the cultivation of oil palm is restricted to the south approximately one quarter of Nigeria, because of its rainfall pattern that varies from marginal to very high rainfall. Ogunkunle (1989) had reported that moisture is not the only constraint to oil palm cultivation in Nigeria. Additionally, Ogunkunle (1989) reported that the chemical soil fertility texture and management of the soil are other factors required apart from rainfall for suitability of Nigerian land for oil palm cultivation. Ogunkunle (1989), while studying NIFOR soil for the suitability of oil palm cultivation, concluded that the NIFOR environment, in spite of the nearly optimum climate condition is only

marginally suitable for oil palm. Earlier stadies done on the oil palms planted for trials on the Umuabi soil were observed to have poor yields relative to the ones at the NIFOR main station. The NIFOR station has been classified as "moderate rainfall" areas in terms of rainfall in Nigeria suitable for oil palm (Ogunkunle, 1989). The palm wine (fermented sap) is a traditional African beverage (Obahiagbon, 2006; Bassir, 1968).The processing and marketing of the bottled oil palm wine started in early 70s and 1979, respectively, by the Nigerian Institute for Oil Palm Research, at the main station, Benin City. The bottling and marketing of the same brand of palm wine started at Umuabi, near Enugu (sub station) in the mid 90s. The wines used for these studies were supplied from NIFOR plantations at the main and sub-stations. The main objective of this study was to compare the nutritional qualities of the processed bottled oil palm wine at the main Station, and at the substation, located at two different ecological zones of Nigeria. It is hoped that the findings from these studies will give useful information to prospective brewers of the oil palm sap/wine and its consumers from these locations.

MATERIALS AND METHODS

Selection *of Elaeis guineensis* (oil palm)

Matured palms were identified by (Otedoh, 1981) the appearance of four female inflorescences on the palms and selected randomly from field 33 (main station) and from the Umuabi plantation (sub-station).

Tapping and Collection of Saps

The method reported by Obahiagbon (2006) and Otedoh(1981) was adopted in the tapping of the palms. The saps were collected in cleaned plastic jerry cans that were previously soaked with nitric acid, washed with soap and rinsed under running tap water and deionized water.

Processing of the Saps

The sap was filtered to remove any debris and dispensed into 33cm^3 green bottles. The bottles were corked with NIFOR fabricated hand corker and pasteurized at 75^{0}C for 45 minutes without the addition of any chemical preservative (Obahiagbon, 2006).

Experinental

Sucrose Determination: The refracto-metric method, described by Maley (1968) was used.

Protein Determination: The micro Kjeldahl method of nitrogen determination and conversion to protein was adopted. That is, protein content in sample (%) = Nitrogen content X 6.25 (Harris, 1970).

Alcohol Content determination: An alcoholmeter was used in the determination of the alcohol contents as reported by Obahiagbon (2006).

Taste Determination: The processing staff, including the author, sipped a little quantity of the palm wine to determine the taste.

Appearance/Color: The oil palm wine samples were poured in clean 100cm^3

beakers and observed.

pH determination: A pocket pH meter was dipped into the samples contained in 100cm^3 beakers and direct reading was obtained from the screen (Bates, 1973).

Acidity Determination: The titrimetric method of A.O.C.S. (1997) was used in the determination of the acid content, as % acetic acid.

Phosphorus Determination: The method described by Murphy *et al.*(1962) was adopted.

Potassium, Magnesium, Calcium and Sodium determination: An atomic absorption spectrophotometer, Model 969, Unican Series was used in the determination of the above elements in the samples.

Chloride determination: The method described by Bailey (1980) was used.

Water-soluble vitamins: The thiamine and riboflavin contents of the sap were assayed for by the A.O.A.C. (2002) method.

STATISTICALANALYSIS

The means ± SD for the parameters measured was compared for statistically significant differences using the student's t-Test.

RESULTS AND DISCUSSION

TABLE 1. RANGE OF NUTRIENT LEVELS IN THE SAMPLED BOTTLED OIL PALM WINE

S/N	PARAMETER	NIFOR MAIN STAITON (BENIN)_CITY)	SUB-STATION(UMUABI)
1.	Taste	Sweet	Sour-sweet
2.	Colour	Whitish	Cloudy-white
3.	P^H		3.20±0.20 - 3.50±0.20
4.	Sucrose (%)	7.00±0.20 - 12.00±0.10	1.50±0.00 - 6.00±0.10
5.	Alcohol (%)	0.40±0.00 - 0.50±0.00	1.50±020 - 3.00±0.00
6.	Acidity(% acetic acid)	0.01±0.00 - 0.12±0.00	0.30±0.00 - 0.45±0.10
7.	Proteins (mg/100ml)	0.05±0.00 - 0.09±0.00	0.01±0.00 - 0.03±0.00
8.	Thiamine (mg/100ml)	0.10±0.00 - 0.30±0.01	0.08±0.00 - 0.19±0.20
9.	Riboflavin (mg/100ml)	0.09±0.01 - 0.19±0.00	0.06±0.00 - 0.45±0.10
10.	Ascorbic acid (mg/100ml)	0.80±0.10 - 1.10±0.10	0.45±0.10 - 0.95±0.00
11.	Phosphorus (mg/100ml)	1.10±0.10 - 2.05±0.00	0.10±0.00 - 0.91±0.00
12.	Potassium (mg/100ml)	56.10±0.00 - 70.50±0.02	14.12±0.01 - 37.15 ±0.10
13.	Magnesium (mg/100ml)	28.25±0.12- 40.20±0.20	16.15±0.20 -.25±2.00
14.	Calcium (mg/100ml)	22.21±0.20 - 36.10±0.30	10.00±0.10 -.20±1.00
15.	Sodium (mg/100ml)	1.10±0.00 - 2.15±0.10	0.02±0.00 - 0.09±0.00
16.	Chloride (mg/100ml)	175.15±0.25 - 285.10±0.20	50.15±0.10 -12±0.10

The results of the analyses are presented in Table 1. The sweet taste and whitish colour observed in the main station product agrees with the characteristics recommended by (Eapen, 1982 and Obahiagbon, 2006) for good quality oil palm wine. The sweet taste was due to the high sucrose contents. The white coloration is attributed to the presence of bacteria forming gums in palm wine, principally by *leuconostocs* (Uzochukwu *et al.,*1989). The taste and colour detected in the sub-station samples did not agree with the palm wine standard and characteristics for good quality palm wine (Okiy and Ojomo, 1989 and Eapen, 1982). The alcohol and acid contents are indicators of the level of fermentation that took place in the samples before the pasteurization. Earlier reports on the fermentation of the sap of *Elaeis*

guineensis by Bassir (1962) had indicated that correlation exists between sucrose, acidity and alcohol contents. The results obtained for the above parameters (sucrose, alcohol and acid content) in the main station samples indicated that the products did not ferment significantly, hence the low levels of alcohol and acid. The same reason can be advanced for the high sucrose content and the sweet taste in the substation samples.

The results obtained for the taste, sugar, alcohol and acidity are indications that fermentation had taken place before the pasteurization temperature was attained. The protein contents of both samples from the main station and substation were low, being a characteristic of the protein content of most palms, and therefore conformed to the standard recommendation for good quality palm wine (Okiy and Ojomo, 1989 and Eapen, 1982). Obviously, since no mineral acids and or alkali were present in the samples, degradation and hydrolysis of the proteins did not take place. The results of the three water-soluble vitamins (thiamine, riboflavin and ascorbic acid) from the main station and substation samples were correlated. The ascorbic acid contents were highest in both samples, followed by riboflavin and thiamine, respectively. Amongst the six mineral elements detected in both samples the chloride concentrations were highest. Potassium concentration was next to the chloride in the main station samples, followed by magnesium, calcium, sodium and phosphorus. In the substation samples, magnesium instead of potassium (as exhibited in the main station samples) was next in concentration. The elemental profiles indicated that the *Elaeis guineensis* has the ability to absorb elements from the soil and translocate them to other parts of the plant. The elements in the various samples were present in varied concentrations, which could be attributed to bioavailability and needs of the palms (Mangle *et al*., 1979). The high concentrations of chloride could be attributed to its wide distribution in nature, its subjection to rapid cycling, and to it being one of the most mobile elements in its ionic form (Mengel *et al*., 1979). Obviously, part of the chloride ion absorbed by the *Elaeis guineensis* under reference, were translocated into the sap of the palms during its production. A consideration of the cations detected in the samples showed that potassium has the highest concentration. This can be attributed to the findings of Grimme *et al*. (1974), who reported that the absorption of cations in the soil is enhanced when the potassium level is low. In other words, the high levels of potassium observed in these studies were correlated with low levels of other cations. The nutrients profile of the bottled palm wine from the locations studied indicated that valuable nutrients required or necessary for human nutrition were present in varied concentrations. The main station product was higher in nutrients than the substation product and thus more nutritious. The differences in ecological zones and environment may be responsible for the results obtained from both products.

CONCLUSION

This research has revealed that environmental factors affect the yields of exudates of palms. The variations in taste of the exudates were due to the differences in the biosynthetic abilities of the palms in their different environments. In the same vein, the variations observed in the bioactive substances may also be linked to the difference in environmental and physiological factors.

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