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Effect of Time of Tapping on *Raphia Hookeri* Palm Wine Production and Sugar Content at Otegbo, Delta State, Nigeria

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Abstract: Effect of time of tapping on R. hookeri palm wine production was investigated at NIFOR Raphia Experimental Station, Otegbo, Ughelli South Local Government Area, Delta State, during the 2010 / 2011 and 2011 / 2012 cropping season with the view of determine the most appropriate time to tapped palm wine for bottled palm wine production. Tapping was done in the morning between 7 to 10 am and evening between 4 to 6 pm respectively. Data were collected on palm wine production (litres / palm), duration of tapping (number of days) and sugar content (%). Data collected were subjected to analysis of variance and descriptive statistics. Their means were compared using the Least Significant Differences ($P<0.05$). Result of the statistical analysis showed that time of tapping significantly influenced R. hookeri palm wine production. Palms tapped in the morning produced significantly higher palm wine than palm tapped in the evening. The duration of tapping and sugar content were not affected by time of tapping; however, duration of tapping significantly affected the palm wine production. The longer the duration of tapping the higher the palm wine produced. The least mean averaged palm wine produced (225.5 litres / palm) was obtained when the palm was tapped for 24 days, while the mean averaged highest (818 litres / palm) palm wine produced was obtained when the palm was tapped for 86 days.

Keywords: Palm wine; Yield; Duration; Sugar; Tapping.

1. Introduction

Raphia traditionally is a very important economic crop and *Raphia* farming is one of the most profitable enterprises for income generation because it provides employment for several numbers of people in the Niger Delta where it is found. These include Palm Wine Tappers, Artefacts, Artisans, Construction and building workers, Gin and Diesel Industries. It is a crop of comparative advantage for socio-economic and poverty alleviation. The popular and numerous products from *Raphia* palm is palm wine which is very nutritive [1]. The palm wine contained eleven elements that the body cannot synthesized by itself and recommended by the American National Academy of Science (2001) as reported in Obahigbon [1] for the maintenance of good health. It also contains three water soluble vitamins thiamine (B_1), riboflavin (B_2) and ascorbic acid (Vitamin C). The demand for palm wine in Nigeria is on the increased on a daily basic because apart from the ones consumed in bars daily; palm wine is specially required in traditional ceremonies like payment of dowry, marriage, village meetings, resolution of conflicts, demarcation of land boundaries and prayers.

Raphia palm is hepaxanmic (flowers ones and dies). It attained exploitative flowering maturity between 6-8 years. Eleven indigenous genera of the palms are available in Nigeria, but only five of these are tapped for palm wine. The five tapped for palm wine include Birassus, Elaies, Hyphaene, Phoenix and Raphia varieties of *R. hookeri* (Mann and Wendl); *R. Vinifera* (Beauv), *R. Sudamica* (Cgev) *and R. Regalis* (Beec) e.t.c. Amongst the Raphia varieties the *R. hookeri* had been reported as the highest yielder of palm wine. *Raphia hookeri* produced between 933.5 to 3112.8 litres of palm wine within a tapping duration of 30 to 100 days respectively [2]. The palm wine is tapped from a panel which consist of the base of short spear leaves and the apical emerging terminal inflorescence axis. The tapping of palm wine from the palm involves the destruction of the terminal apical tissues emerging

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inflorescences and the petiole of their subtending short spear leave. Flowering is completely halted and no seeds are produced from tapped palm. Tapping is done either in the morning or evening. It was observed by Udom [3], that palm wine collected from palm tapped in the morning is more than those tapped in the evening. In addition the tappers and consumers prefer morning wine than evening wine because they believe that morning wine is sweeter than the evening wine. NIFOR Palm Wine bottling Unit at Otegbo and Main Station make use of morning tapped palm wine for bottled palm wine production, while palm tapped in the evening is usually distilled to produced gin or sold without bottling. Although, this observation has not be prove by well detailed research, however oral discussion with the consumers and workers, shown that they preferred morning tapped palm wine to that of evening tapped palm wine, thus there is a need to investigate the effect of time of tapping on palm wine yield and sugar content with the view of determine when appropriate to tapped *Raphia hookeri* for bottled palm wine production

2. Materials and Methods

The experiment was conducted at Raphia Experimental Station, Otegbo, Ughelli South Local Government Area, Delta State, which lies essentially between latitude $4^0\,15^1$ to $5^0\,00^1$N and longitude $4^0\,11^1$ to $6^0\,25^1$E. The experiment was conducted in 2010 and 2011 production season. A total of 40 palms were tapped in 2010 and 2011 respectively. 20 palms were tapped in the morning and 20 palms in the evening for palm wine production respectively. Data were collected on tapping duration / number of days the palm was tapped, yield of palm wine / litre / palm, and sugar contents (sweetness) of the palm wine. The sugar content was tested using testometer. Data collected were subjected to a descriptive statistics such as means, frequency and percentages.

3. Result and Discussion

3.1. Nutritive Value of Palm Wine

The physical and chemical properties of *Raphia hookeri* palm wine is presented in Table 1. The palm wine is very nutritive and rich in minerals and vitamins. It contains eleven mineral elements that are essential to the body which the body cannot synthesis on its own. It also contains three essential water soluble vitamins such as thiamine B1, riboflavin B2 and ascorbic acid Vit. C which the body needs to fight germs or develop resistance to diseases attacks. Palm wine is also proteinous, thus help in nourishing the body. According to Udom (2000), raphia palm wine is very nutritional and as results it is preferred to any other sources of palm wine in Akwa Ibom and its environs.

3.2. Palm Wine Production

Palm wine production as affected by time of tapping is presented in Table 2. The results of the statistical analysis shown that tapping time significantly ($p \leq 0.05$) affected *Raphia hookeri* palm wine production. Palm tapped in the morning produced significantly ($p \leq 0.05$) higher palm wine 472 litres / palm as compared to palm tapped in the evening 317 litres / palm. Palm wine production in the morning account for 60.9% of the total palm wine produced while palm tapped in the evening account for 39.1% of the palm wine produced Fig 1. The high production of *Raphia hookeri* tapped in the morning over evening palm wine production is attributed to favourable micro climate in the morning compared to evening when the palm would have being subjected to environmental stress due to physical and biochemical processing occurring in the plant during the day. According to Obahigbon [1], he observed that palm wine flow decreases and eventually stopped when the palm can no longer withstand the tapping stress.

The period of tapping has no significant effect on duration of tapping Table 2 while the duration of tapping or length of flow had significant effect on palm wine yield Fig 2. The longer the duration of tapping, the higher the palm wine production. The highest palm wine yield production was obtained when the palm was tapped for 86days (818 litres / palm) while the least palm production was obtained when the palm was tapped for 24 days (225.5 litres / palm) respectively. The tapping duration of *Raphia hookeri* varied from palm to palm [4]. *Raphia hookeri* can be tapped between 10 to 120 days depending on the location or environment in which the palm grow. Upland *Raphia hookeri* usually yield lower than the swamp environment.

Palm wine production increase as the duration of tapping increased, thus the palm wine yield is a product of the number of days it flows. The least quantity of palm wine produced was obtained when the palm was tapped for 24 days (222.3 litres / palm) and this account for 11.4% of the average palm wine produced, while the highest palm wine production (818 litres / palm) was obtained when the palm was tapped for 86 days and this account for 41.8 % of the total palm wine produced. Tapping period has no significant effect on the percentage of sugar content of the palm wine Table 2. However, the percentage of sugar content of *Raphia hookeri* tapped in the morning was 51.5% to that tapped in the evening 48.5%. The non significant difference is an indication that palm wine tapped in the evening is also sweet, but because of its late arrival could not be process into bottled palm wine, since palm wine production is done during the day, evening palm wine is either sold for direct consumption or fermented or distilled for gin production, because when it is allow to stay without process immediately biochemical process of fermentation occur which results to sourer taste of the wine.

4. Conclusion

Results of this study show that *Raphia hookeri* palm wine production is higher when tapped in the morning than evening tapping. Tapping time has no significant effect on sugar content of the palm wine, both morning and evening palm wine could be use for palm wine bottling provided provision is made for evening palm wine bottling, but if not the best time for tapping should be in the morning rather than evening because late arrival of the palm wine tapped will be store till next day, thus causing fermentation of the products.

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Table-1. Physical and chemical properties of palm wine of *R. hookeri* palm.

Parameter	***Value (%)***
Physical	
Texture	*Water/ colloidal*
Taste	*Sweet*
Flavour	*Palm wine*
Moisture	*95%*
Chemical	
Total Protein	*0.24*
Thiamine	*0.31*
Riboflavin	*0.21*
Ascorbic acid	*1.50*
Chloride	*157.0*
Nitrogen	*7.0*
Sodium	*4.90*
Potassium	*80.0*
Calcium	*31.40*
Magnesium	*57.20*
Iron	*2.20*
Manganese	*7.00*
Zinc	*0.11*
Phosphorus	*4.40*

American National Academy of Science (2001)

Table-2. Palm wine Production as affected by time of tapping at Otegbo.

Treatments	**Mean palm wine yield Litres/palm**	**Mean duration of tapping /palm**	**Mean sugar content (%) /palm**
Morning	472	45.0	266.6
Evening	317	43.2	250.6
SED	55.20	16.05	109.9
CV	4.5	18.24	13.4
LSD	127.29	NS	NS

Fig-1. Effect of tapping period on palm wine yield

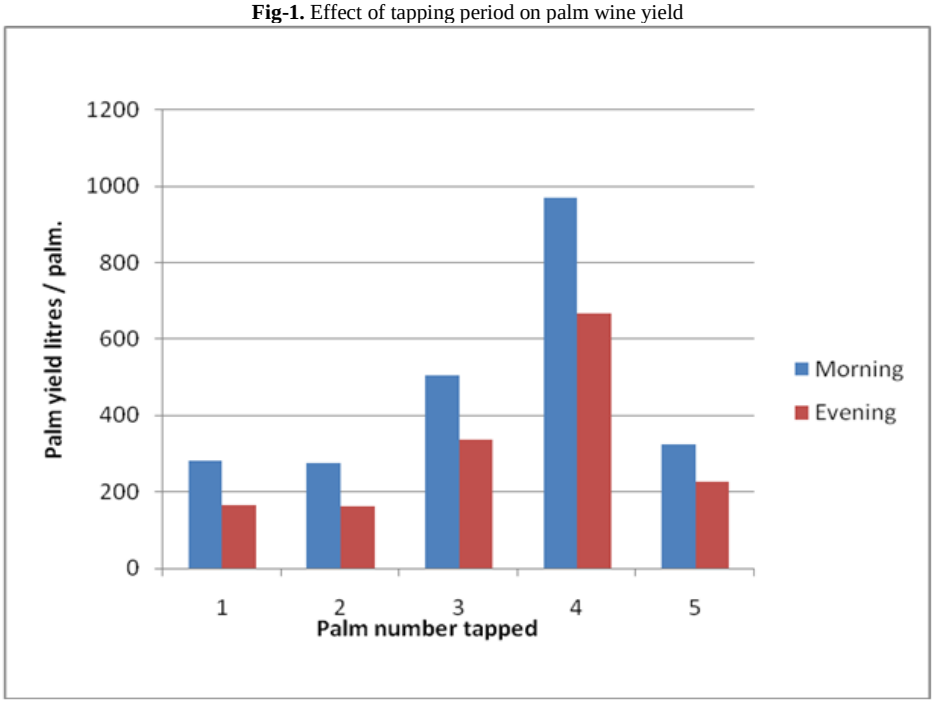

Fig-2. Effect of duration of tapping on R. hookeri palm wine yield.