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The Implications of Heat and Preservative on the Exudates of *Raphia Vinifera* Palm Obtained From the Nigerian Institute for Oil Palm Research Benin City

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ABSTRACT: The exudates of *Raphia vinfera* palms was obtained by tapping while the palms were standing erect, without the application of fire at tapping panel to stimulate the flow of the exudates. The exudate was pasteurised at different temperatures and time, with and without the preservative, sodium metabisulphite. Physico-chemical assays were done on the pasteurized samples with standard methods to ascertain the effects of heat and the preservative and thus the stability of the nutrients. The results revealed that the palm exudates could be preserved without the chemical preservative if treated at 75 °C for 45 minutes. Statistical analysis indicated that there were no significant differences between the fresh sap and the pasteurized exudates at 75 °C for 45 minutes with respect to their nutrient levels.

Keywords: *Raphia vinifera* exudates, Heat treatment, Sodium Metabisulphite, Pasteurisation, Nutrients

Introduction

Literature is currently not available on the exudates of Raphia *vinifera* palm. Consequently, citations are not available The *Raphia vinifera*palm exudates is the colourless liquid or sap which flows from the palm, when it is tapped at the base of the inflorescence. This is also called the palm wine. The palm wine is the fermented exudates of the palms. Depending on the source of the fermented exudates it could be descried thus: the fermented exudates from *Elaeis guineesis* is called Oil palm wine: while the palm wine from *Raphia vinifera*is called *Raphia vinifera* palm wine etc. The palm exudate is drunk by millions of people in Africa.

Due to the social and cultural significances of the palm wine, attempts were made in the past to preserve it, because its fermentation rate is fast. Bassir (1962) observed that within twenty-four hours of fermentation process in the palm wine from *Elaesis guineensis* that the sucrose concentration dropped to 50 %.

Earlier attempts to preserve the palm wine had attracted these methods: in the South-South geopolitical zone of Nigeria, the indigenes or natives attempted to preserve the palm wine by the addition of *Saccaglottis gabooesis*, the bark of a tree; Levi and Oruche (1957) described the use of refrigeration, which only delayed fermentation but could not preserve it and suggested the use of chemical preservatives as an alternative; Chinnarasa (1968) suggested the addition of burnt lime and sodium metabisulphite; Eapen (1982) recommended a method of preservation by heat treatment or pasteurisations (at 70 °C/30 minutes) and the addition of sodium metabisulphite, as preservative. The method recommended by Eapen (1982), was adopted by most processors when the bottled palm wine was introduced into the Nigerian market. Preservatives act as antimicrobials or as antioxidants or both. As antimicrobials they prevent the growth of moulds, yeasts and bacteria (Foulke, 1993). The preservative used in this study is sodium metabisulphite,

which acts as sulphite preservative.

Following the U.S. Food and Drugs Administration Act on the use of chemical preservative in foods, and reactions from consumers who often had stomach ache, running stomach *etc* when the product was drunk, we decided to conduct this study on the possibility of eliminating the chemical preservative, sodium metabisulphite, which most people were reacting to (Foulke, 3993). The focus of this study therefore, is to present a new method of preserving the exudates *of Raphia vinifera* in its natural form by the application of heat only as most consumers were becoming more and more scared about the addition of chemicals in foods, since some of the preservative are carcinogenic.

Materials and Methods

***Tapping of Palms and Collection of Exudates*:** All the reagents used for the chemical analysis were of Analar grade. The *Raphia* palms used for this study we located in the experimental field of the Nigerian Institute for Oil Palm Research, Benin City, Nigeria. The palm tree was tapped while the matured *Raphia vinifera* palms were standing erect without the application of heat at the tapping panel to stimulate the flow of the exudate as described by Otedoh (1990) and were collected in cleaned plastic jerry cans.

***Processing and Pasteurisation of Exudates*:** The exudates was filtered to remove all the debris. The filtrate was dispensed into 33ml green bottles, corked manually, and pasteurized at 70^0 C for 30min, 75 °C for 30 minutes and 75 °C for 45 min with or without the addition of chemical preservative. The quantity of preservative used was 0.025 g per 33 ml (Eapen, 1982).

***Determination of Nutrients*:** The parameters examined in the exudates were: sucrose content, total protein; acid content (acetic acid), alcohol content; taste/sweetness; foaming and colour.

***Sucrose*:** The sucrose content was determined by refractometric method (Maley, 1968).

***Protein*:** The total protein/nitrogen was determined by using the micro-Kjeldahl method (Harris, 1990).

***Acidity*:** The acidity was estimated as % acetic acid by titrimetric method of 0.1N sodium hydroxide, with phenolphthalein as indicator.(A.O.C.S,1997).

Alcohol: Alcohol content was determined with an alcoholmeter in percentage.

***Taste*:** The taste or state of sweetness was determined by sipping a little portion of the sap, done by three Scientists, including the authors.

***Foaming*:** The foaming nature of the sap was detected by pouring 50 ml into a conical flask, shaken and allowed to rest on the bench.

Statistical Analysis: The data were analysed statistically, with the Analysis of Variance (ANOVA) and Student T-test.

Results

The results for this work are presented in Table l. The nutrients assayed for were detectable in the exudates of the *Raphia vinifera* palms in various concentrations. The sucrose concentrations of the exudates ranged between 6 % and 8 %, which is regarded as good quality based on earlier reports on *Raphia hookeri* palm exudates (Obahiagbon and Oviasogie, 2007; Eapen, 1982). The refractometric reading of the concentration of sucrose confirms the sweetness observed about the fresh exudates and the degradation of the sucrose as indicated by treatments less than 75°C for 45 minutes. The protein contents in the fresh and treated samples were low, below 0.1 %. The alcohol concentrations of the fresh samples were also low, less than 1 %, whereas in all the treatment under 75 °C for 45 minutes, increased alcohol contents were noticed rising to a level of 2.6 %. Additionally, whitish fungi growth were also observed in the treated samples done under 75 °C for 45 minutes.

Table 1: Implication of heat and preservative on the exudates of *Raphia vinifera* palm

		Sucrose%	**Total protein (mg/100ml)**	**A tidily % - (Ace lie acid)**	**Alcohol %**	**Taste**	**Foaming**	**Colour**	**Fungal Growth**
Fresh sap (day1)		8.50	0.01	0.20	0.50	Sweet	Stable	Whitish	_
Pasteurized (30 mins)	Month								
70°C (without preservative)	1	6.70±0.00	8.04±0.00	0.25±0.00	0,50±0.0	Sour		Slightly	Whitish
	3	7.40±0.01	0.03±0.00	0,24±0.00	0,05±0.0	sweet	Stable	brownish	Fungi
	6	6.70±0.10	0.03±0.10	0,27±0.00	1.50±0.0	after 9		sediments	after 4
	9	4.60±0.01	0.03±0.10	0.65±0.000	2.0±0.0	months		by 12^{lh}	Weeks
	12	4.50±0.00	0.03±0.00	0.65±0.0	2.20±.0.0			Month	
70°C (with preservative)	1	7.45±0.01	0.04±0.00	0.24±0.0	0.50±0.0				Whitish
	3	7.39±0.00	0.03±0.10	0.24±0.0	0.50±0.0	"	Stable	11	fungi
	6	6.70±0.00	0.03±0.00	0.30±0.0	1.60±0.10				After 4
	9	4.59±0.00	0.03±0.10	0.65±0.0	2.50±0.10				weeks
	12	4.50±0.01	0.03±0.10	0.69±0.0	2.50±o.10				
75°C (without preservative)	1	8.30±0.00	0.04±0.00	0.25±0.0	0.50±0.00				Whitish
	3	8.10±0.00	0.03±0.10	0.27±0.0	0.50±0.00		Stable	"	fungi
	6	8.10±0.00	0.04±0.01	0.28±0.0	0.50±0.00				after 4
	9	6.50±0.10	0.03±0.00	0.31±0.0	2.50±0.10				weeks
	12	6.00±0.00	0.03±0.01	0.40±0.0	2.60±0.20				
75°C (with preservative)	1	S.20±0.01	0,03±0.00	0.27±0.0	0.50±0.00				Whitish
	3	8.15±0.00	0,04±0.00	0.27±0.0	0.50±0.00	"	Stable	"	fungi
	6	8.10±0.01	0.03±0.01	0.38±0.0	1.90±0.00				after 4
	9	6.49±0..10	0.03±0.00	0.39±0.0	2.10±0.10				
	12	6.10±0.00	0.03±0.10	0.40±0.0	2.50±0.20				weeks
Pasteurized (45 mins)									
75°C (without preservative)	1	8.50±0.00	0.04±0.01	0.20±0.0	0.50±0.00				No
	3	8.45±0.00	0.03±0.00	0.21±0.0	0.48±0.00	Sweet	Stable	Whitish	whitish
	6	8.47±0.01	0.03±0,01	0.22±0.0	0.49±0.00				
	9	8.49±0.00	0.03±0,01	0.21±0.0	0.47±0.00				fungal
	12	8.46±0.01	0.03±0.00	0.22±0.0	0.48±0.00				growth
7S°C (with preservative)	1	8,50±0.00	0.04±0.00	0.20±0.0	0.50±0.00				No
	3	8,47±0.00	0.03±0.01	0.21±0.0	0.49±0.00	Sweet	Stable	Whitish	whitish
	6	8.45±0.01	0.03±0.01	0.22±0.0	0.48±0.00				
	9	8.48±0.00	0.03±0.01	0.22±0.0	0.47±0.00				fungal
	12	8.45±0.01	0.03±0.00	0.21±0.0	0.49.±0.0				growth

Discussion

The deterioration or degradation in the sucrose contents during the above treatment could be attributed to the inadequate heat treatment and time of exposure needed to destroy or inactivate the yeast, *Saccharomyces cerevisiae*, which fermented the exudate (Bassir, 1962). As a consequence of the partial fermentation that was on within the corked bottles, carbon dioxide was released as a by-product, which led to its accumulation, and subsequent explosion of some of the bottles. But this observation was not noticed in the treatment at 75°C/45 minutes, which indicated that the yeast was destroyed or inactivated, hence there was no deterioration noticed in the sucrose content.

The preservative appeared not to have produced any noticeable effect, compared to the treatments without the preservative. The samples under the treatment at 70°C and 75°C for 30 minutes were sour to taste, being an indication of spoilage. The application of the sulphite preservative appeared not to have been able to arrest the spoilage perhaps due to earlier reports on its usage (Rankin *et al*, 1976; Foulke, 1993). The taste of the sap treated at 75 °C for 45 minutes was palatable/sweet just like the fresh sap; being an indication that fermentation was arrested hence the sucrose did not deteriorate.

The acidity (acetic acid) and alcohol contents of treatment at 70 °C and 75 °C for 30 minutes increased due to fermentation. Whereas, treatment at 75 °C for 45 minutes did not show any increase in acidity and alcohol content, being an indication that the yeast responsible for the fermentation was inactivated. A correlation existed in the results obtained from the treatment at 70 °C and 75 °C for 30 minutes. The result showed that a decrease in sucrose content correlated with increases in acid and alcohol contents (Bassir, 1962). In all the treatment, no significant differences were observed in the protein contents of the sap. In other words, degradation did not take place, since no mineral acids and or alkali was present to hydrolyse the protein to its constituent amino acids (Obahiagbon and Oviasogie 2007).

Stable foaming and whitish colour are parameters described by Eapen (1982) for the identification of good quality Oil palm wine. In this report or studies all the treated samples had stable foam, even though deterioration started in the 9th Month of samples examined at 70 °C/75 °C for 30 rninutes for the reason given above. Additionally, the above effect was also manifested in the colour of the samples treated at below 75^{o}c for 45 minutes. But in the treatment at 75 °C/45 minutes with or without preservative; the colour was consistent for 12 months. The fungi growth that was observed in the treatment at 70 °C/75 °C for 30minutes could be attributed to inadequate pasteurisation because this did not manifest in the treatment at 75°C/45 minutes.

In conclusion, a method for the preservation of the sap of *Raphia vinifera* exudates without the addition of chemical preservative with a minimum shelf life of 12 months is hereby presented.

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