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Production, Quality Assessment and Acceptability of Beverage Produced from Palmyra Fruits and Roselle Calyces

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ABSTRACT

The physico-chemical properties and acceptability of six formulated beverages obtained from a blend of Palmyra fruits(Borassusoethiopum) and Roselle calyces (Hibiscusssabdariffa) were investigated. The formulated beverages were blended at different ratios and with 100% palmyra beverage as control.The moisture, totalash, totalsoluble solid content and pH were determined using standard procedures.The viscosities of the samples were evaluated using viscometer. Thedata obtained were analyzed using ANOVA while the means were separated using Duncan Multiple range test.The results showed that there were significant differences obtained in all the parameters measured at ($p \leq 0.05$).Palmyra beverage has the lowest moisture content of 78.40% as compared to mixed beverage. There was an observed increase in moisture content as concentration of the roselle calyces increases in the blend.Titrable acidity and total solid content of the beverage fall within the limits of recommended standard while majority of the juices had (^{o}brix) level below the recommended standard except sample F(100%palmyra beverage).Palmyra beverage recorded higher viscosity and pH compared to other mixed beverage and was rated the best from the sensory attributes by panelists.This inferred that our local fruit can serve for beverage production instead of relying on imported beverage.

INTRODUCTION

Fruit beverage could be defined as the extractable fluid from fruits. It is usually obtained directly from fruit by mechanical expression for the production of syrups, jellies, fruit candies (Belitz *et al.*,2009).Fruits can be processed into various products such as beverages, fruit salad , wine e.t.c. Fruits and their juices are good sources ofVitamin C, minor minerals including iron, copper, zinc and manganese (Abu-Tarboush ,1997).Some fruit beverages contain significant quantities of sugar and this could be of importance as source of dietary energy, especially among low level of proteins and amino acid to be of nutritional significance. Apart from the nutritional value, fruit beverages contain phytochemical compounds and therefore offer an additional health benefits and making the product to be increasingly popular (Ahmed Ali *et al.* 2010).They are originally produced as a result of surplus production of fruits, but it is obtained from processing specially grown species for that purpose. Popular beverages are not limited to apple, orange, grape fruit, pineapple, mango e.t.c.(Frazier and Westhoff, 1986). Fruits are difficult to

keep for a considerable length of time, thus ripe fruits are utilized either as fresh fruits or processed into beverages. Most fruits are perishable in their natural state after harvest; deterioration sets in almost immediately due to metabolic activities which continue after harvest. The perishable nature makes it difficult to store and preserve; hence there is gradual loss of flavor and nutritional value. It is highly essential to process and preserve the fruits in order to guarantee regular supply at affordable prices. Hence, there is the need to increase the efficiency of extraction of juice from fruits in order to reduce postharvest losses and thereby ensure an all-season availability of beverage at reasonable cost. Common methods of preservation and processing of fruit juices include: canning, pasteurization, freezing e.t.c **(**Fasoyiro *et al.,* 2005). It is becoming increasingly popular to combine a variety of fruits into single mixed beverage. Popular blends include strawberry and apple, apple and black current. In Nigeria, some of the popular mixed beverages are imported. There is therefore the need to look inwards to source for some of our local fruits with high potential for juice production and processed as beverage in order to stop the drain on foreign exchange and at the same time meet the demands of our local industries. A number of our local fruits, vegetables and nuts have the potential to produce beverages but information on their production potential is scanty. Therefore, the objective of this study is to produce beverage from a combination of palmyra fruits and roselle calyces and to evaluate the physicochemical properties and the level of acceptability.

MATERIALS AND METHODS

Palmyra fruits were bought from Jallingo market Taraba state, Nigeria. Matured sun dried Rosellecalyces(*Hibiscus sabdriffa*) was bought from Girei Local market, Girei L.G.A. Adamawa state, Nigeria. The equipments and reagents used for laboratory analysis were obtained from Food science and Technology laboratory of Modibbo Adama University of Technology Yola, Adamawa state, Nigeria. All the reagents used were purshased from a recognized distributor and are of analytical grade.

Juice extraction

The procedure for the extraction of juice from Roselle calyses and Palmyra fruit followed the method described by (Chen *et al.,* 1998) as shown in Fig 1.Dried Roselle calyces was manually sorted, cleaned, washed to remove contaminants and soaked in clean water. It was then heated for 15minutes at 80^0C and allowed to cool, filtered and water added to extract the juice. Similarly, fully ripe Palmyra fruit whose sugar and flavor were at their optimal peak was selected, washed,

peeled and blended with a blender to extract the juice. The juice obtained was strained through a muslin cloth and the filtrate was again weighed. The mixed beverage was then formulated on a mixed juice extract ratio as shown in Table 1. Sugar was added to the mixed beverage until 11^0brix was obtained and then pasteurized at 80^0C for 5minutes.

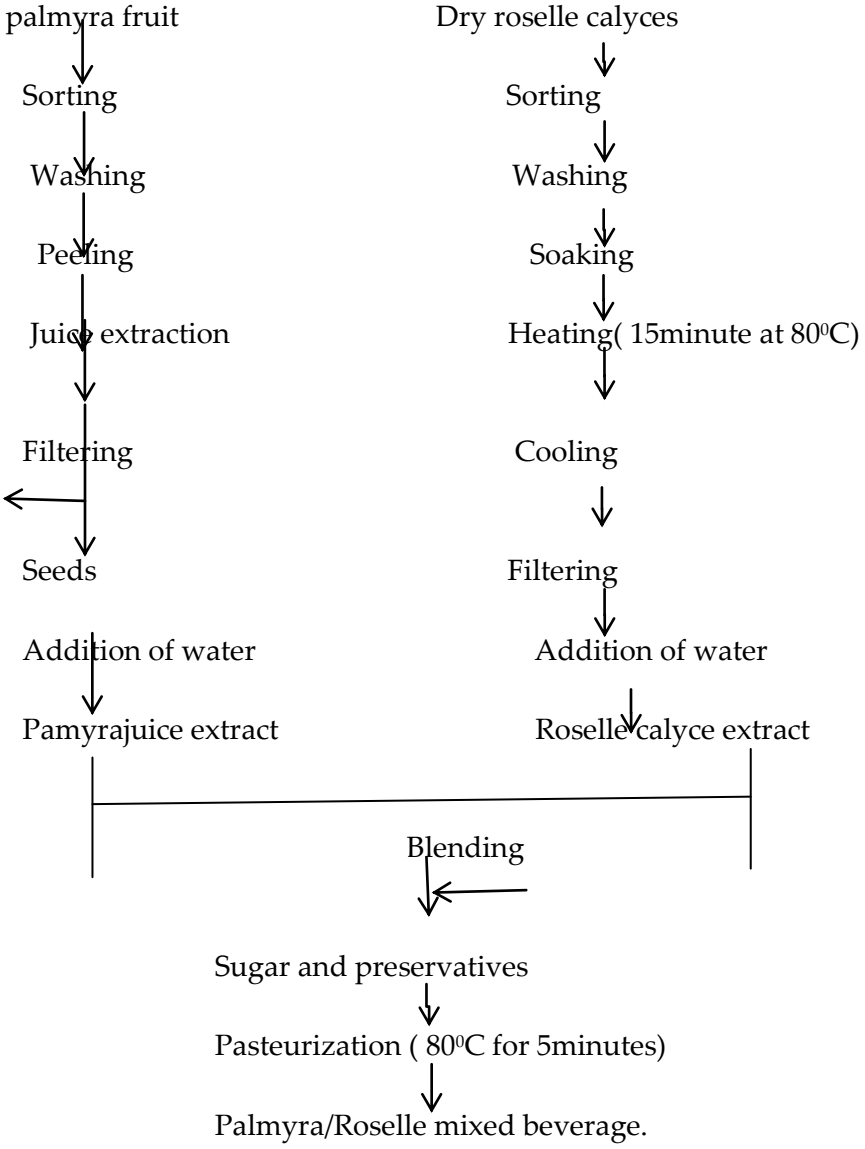

Figure1.Production of Palmyra and Roselle calyces mixed beverage.

Table 1 Formulation of mixed beverage ratio

Sample	Palmyra juice (%)	Roselle calyces juice (%)
A	50	50
B	60	40
C	70	30
D	80	20
E	90	10
F	100	0

Chemical Analysis

The pH of samples were determined at 30^{o}C using digital pH meter as described by Adel eke and Abiodun (2010)..The moisture content in the samples was estimated by oven drying method as described by AOAC (1990) while total solid content of samples were estimated using gravimetric method described by(Egan *et al.*, 1981) .The ash content of samples determination followed the method described by AOAC (2000)**.**Total soluble solid (%Brix) was measured using refractometer as described by AOAC (1990)**.**The titrable acidity(TTA), expressed as %lactic acid, was determined by titrating 10ml aliquots with 0.1M Na0H solution using phenolpthalein as indicator as described by (Pearson 1981) **.**The viscosity was determined by the method described by AOAC (1990) using a viscometer.

Sensory evaluation

The sensory evaluation of the samples was carried out by the method described by Ihekoronye and Ngoddy(1985) for consumer acceptance and preference using 7-point Hedonic scale by 20 untrained judges. The results obtained from the sensory evaluation were tested at 5% level of confidence.

Statistical Analysis

The general linear model (GLM) of SPSS Statistical package (version 16.0) was used for the statistical analysis of results .All the results obtained for the statistical analysis were subjected to analysis of variance (ANOVA) to determine differences within the samples (Snedecor and Cochran, 1987)**.**Duncan Multiple Range Test (Duncan, 1995) was used to determine the differences with the variation at 95% confidence limit ($p<0.05$).

RESULTS AND DISCUSSION

The physicochemical properties of mixed beverage of Palmyra and Roselle calyces are presented in Table 1.The results showed that there were significant differences observed at p≤ 0.05 in all the parameters measured. The results showed that the Palmyra beverage alone recorded the lowest moisture and highest ash content compared to the mixed beverage samples. The higher moisture content for the mixed beverage could be attributable to the high moisture content from the rosellecalyces juice in the mixed beverage. The titrableacidity for all the samples varied from 0.15-0.42%.The values agree with the value reported by FAO (1977).FAO (1977) reported titrable acidity for fruit beverage not greater than 3.5%.Total solid content varied from 11.45-21.80%.The value compares favorably with the standard recommended by FAO (1977).It was reported that fruit juice should not contain less than 10% total solid. **Osuntogun and Aboaba (2004)** had observed that a high total solid content in fruit beverage is not desirable as the solid will settle down on storage and thereby reduce the quality of the beverage. The total soluble solid content (^{o}brix)of the beverage samples ranged from 2.40-4.55^{o}brix.All the beverage samples recorded^{o}brix levels below the standard recommended by FAO(1977) except for sample F.It was reported that fruit beverage blend with less than 7^{o}brix was categorized as weak and watery(Osuntogun and AboabaO, 2004). This implies that the total soluble solid for all the samples are low (<7mg/100ml)(Osuntogun and Aboaba 2004)except for sample F. Hence the mixed beverage samples will be rated as weak and watery. The influence of the Roselle calyces juice in the mixed beverage could reduce the total soluble solid in the mixed beverage as a result of dilution because of their high moisture content Obadina and Oyewole(2007).The pH of palmyra beverage was observed to be higher than the value obtained for the mixed beverage samples. This could be attributed to higher acidity in the rosellecalyces juice in the mixed beverage the observed lower titrable acidity in the palmyra beverage translates to a higher pH value. The viscosity of palmyra beverage was also observed to be higher than that of the mixed beverage. This could be expected in the mixed beverage as rosellecalyces juice must slightly reduce the viscosity by dilution.

Sensory evaluation

The result of sensory evaluation of fruit beverage samples is shown on Table 2. The results showed that there were significant differences observed at p≤ 0.05in all the parameters measured. Sample F recorded superior mean scores for all the sensory qualities measured compared to mixed beverage samples.

CONCLUSION

From the results of this study, sample F of palmyra beverage showed a better quality from physicochemical and sensory quality and is rated the best. This inferred that local fruit can serve for beverage production instead of relying on imported and more expensive beverage.

Table 2: Physico-chemical properties of mixed beverage

Samples	Moisture (%)	Ash (%)	TA (%)	pH	Viscosity(cp)	°Brix	Total solid (%)
A	88.25±0.25^{a}	1.05±0.10^{b}	0.42±0.10^{a}	4.35.±0.01^{d}	3.37±0.01^{d}	2.40±0.00^{d}	11.45±0.05^{f}
B	86.40±0.40^{b}	1.05±0.10^{b}	0.41±0.10^{a}	4.42±0.02^{cd}	2.81±0.10^{e}	2.55±0.07^{d}	14.10±0.10^{e}
C	84.10±0.10^{c}	1.05±0.10^{b}	0.25±0.02^{b}	4.46±0.01^{bc}	2.81±0.10^{e}	3.30±0.05^{c}	15.90±0.10^{d}
D	82.70±0.10^{d}	1.15±0.10^{ab}	0.32±0.05^{bc}	4.46±0.01^{bc}	4.40±0.10^{c}	3.89±0.09^{b}	17.40±0.20^{c}
E	80.40±0.02^{e}	1.50±0.10^{a}	0.19±0.01^{cd}	4.53±0.02^{b}	4.49±0.01^{e}	4.10±0.01^{b}	19.50±0.10^{b}
F	78.40±0.10^{f}	1.59±0.10^{a}	0.15±0.01^{d}	4.62±0.02^{a}	5.04±0.00^{a}	4.55±0.05^{a}	21.80±0.10^{a}

Each value is means ± SD of three determinations. Values within each column with different superscripts are significantly different from each other at ($P \geq 0.05$)

Table 3: Sensory evaluation of mixed beverage

Samples	Appearance	Colour	Flavour	Consistency	Overall Acceptability
A	6.10±0.43^{ab}	6.40±0.16^{a}	5.90±0.41^{ab}	6.10±0.43^{ab}	6.30±0.15^{ab}
B	6.70±0.21^{a}	5.80±0.22^{b}	4.90±0.50^{bcd}	6.40±0.16^{a}	6.00±0.15^{c}
C	5.40±0.43^{b}	4.40±0.37^{b}	3.90±0.69^{d}	4.70±0.47^{ab}	4.80±0.00^{c}
D	3.80±0.49^{c}	3.80±0.44^{e}	4.40±0.43^{cd}	4.10±0.57^{c}	4.10±0.23^{b}
E	6.80±0.13^{a}	5.90±0.18^{a}	5.70±0.26^{abc}	5.60±0.40^{ab}	6.10±0.32^{ab}
F	6.70±0.21^{a}	6.20±0.29^{a}	6.50±0.22^{a}	6.30±0.21^{a}	6.70±0.48^{a}

Each value is means ± SD of three determinations. Values within each column with different superscripts are significantly different from each other at ($P \geq 0.05$)

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