Evaluation of chemical composition and acceptability of fruit drinks made from noni, date and jack

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Abstract

Fresh fruits are seasonally available and processing enables them to be available all year round. Noni fruit extract blend with date and jackfruits to produce smoothie, fruit drinks and concentrate is a convenient alternative for its utilization. Therefore, the study was carried out to evaluate the chemical composition and acceptability of fruit drinks made from noni, date and jackfruits. Freshly matured noni and Jackfruit fruits were sourced from a Green Healthcare Foundation Botanical Garden and identified by a qualified plant taxonomist. Date fruit was sourced from Relief Market Owerri. The fruits were washed, deseeded, sliced, soaked/dried, ground, sieved and packaged in airtight container respectively. Standard methods were used to determine the proximate and sensory properties of the fruit blend. The fruits were blended in the ratio of 80:10:10, 70:15:15, 60:20:20, 100:0:0, respectively. The blends were subjected to chemical analysis and sensory evaluation. Moisture content of the fruit drinks A,B,C and D were determined using oven dry method of AOAC (2016). Crude protein content was determined by micro Kjeldahl method as described by AOAC (2016). Fat content was determined using Soxhlex extraction method of AOAC (2016). Crude fiber, Ash and Carbohydrate were also determined using AOAC, (2016). Data were analysed using SPSS version 20.0 and $p<0.05$ accepted as level of significance. Moisture content of the fruit drinks samples ranged from 59.23% for (fruit drink C) to 94.34% for fruit drink D. Crude fibre content ranged from 0.09% for sample B to 0.20% for (sample D). Fat content ranged from 1.50% fruit drink D to 4.48% fruit drink C. Fat content of fruit drink C was significantly($p>0.05$) different when compared to fruit drink A, B and D. Fat content of fruit drink A and fruit drink B was not significantly different ($P<0.05$). Protein content ranged from 1.05% of fruit drink A and B to 5.07% of fruit drink C. Ash of the samples ranged from 0.29% for fruit drink B to 1.07% for fruit drink C. Carbohydrate content of the fruit drinks samples ranged from 2.45% for fruit drink D to 29.96% for fruit drink A. All the samples were accepted. (Proximate composition of the fruit drinks revealed high moisture, good amount of crude fibre, protein, ash and low fat). The amount of carbohydrate and protein shows the drink can serve as good source of energy for the body.

Keywords: Noni, Jackfruit, Dates, Proximate and Sensory Evaluation.

Évaluation de la composition chimique et de l'acceptabilité des boissons aux fruits à base de noni, de datte et de jack

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Resume

Les fruits frais sont disponibles de façon saisonnière et la transformation leur permet d'être disponibles toute l'année. Le mélange d'extraits de fruits de noni avec des dattes et des jacquiers pour produire des smoothies, des boissons aux fruits et des concentrés constitue une alternative pratique pour son utilisation. Par conséquent, l'étude a été réalisée pour évaluer la composition chimique et l'acceptabilité des boissons aux fruits à base de noni, de dattes et de jacquier. Les fruits de noni et de jacquier fraîchement mûris proviennent d'un jardin botanique de la Green Healthcare Foundation et ont été identifiés par un taxonomiste végétal qualifié. Les dattes proviennent du Relief Market Owerri. Les fruits ont été respectivement lavés, épépinés, tranchés, trempés/séchés, broyés, tamisés et emballés dans un récipient hermétique. Des méthodes standards ont été utilisées pour déterminer les propriétés immédiates et sensorielles du mélange de fruits. Les fruits ont été mélangés dans un rapport de 80:10:10, 70:15:15, 60:20:20 et 100:0:0, respectivement. Les mélanges ont été soumis à une analyse chimique et à une évaluation sensorielle. La teneur en humidité des boissons aux fruits A, B, C et D a été déterminée à l'aide de la méthode de séchage au four de l'AOAC (2016). La teneur en protéines brutes a été déterminée par la méthode micro Kjeldahl décrite par AOAC (2016). La teneur en matières grasses a été déterminée à l'aide de la méthode d'extraction Soxhlex de l'AOAC (2016). Les fibres brutes, les cendres et les glucides ont également été déterminés à l'aide de l'AOAC (2016). Les données ont été analysées à l'aide de SPSS version 20.0 et $p < 0,05$ accepté comme niveau de signification. La teneur en humidité des échantillons de boissons aux fruits variait de 59,23 % pour (boisson aux fruits C) à 94,34 % pour la boisson aux fruits D. La teneur en fibres brutes variait de 0,09 % pour l'échantillon B à 0,20 % pour (échantillon D). La teneur en matières grasses variait de 1,50 % de la boisson aux fruits D à 4,48 % de la boisson aux fruits C. La teneur en matières grasses de la boisson aux fruits C était significativement différente ($p>0,05$) par rapport à celle des boissons aux fruits A, B et D. Teneur en matières grasses de la boisson aux fruits A et de la boisson aux fruits B n'était pas significativement différent ($P <0,05$). La teneur en protéines variait de 1,05 % pour les boissons aux fruits A et B à 5,07 % pour la boisson aux fruits C. Les cendres des échantillons variaient de 0,29 % pour la boisson aux fruits B à 1,07 % pour la boisson aux fruits C. La teneur en glucides des échantillons de boissons aux fruits variait de 2,45 % pour la boisson aux fruits D à 29,96 % pour la boisson aux fruits A. Tous les échantillons ont été acceptés. (La composition approximative des boissons aux fruits a révélé une humidité élevée, une bonne quantité de fibres brutes, de protéines, de cendres et une faible teneur en matières grasses). La quantité de glucides et de protéines montre que la boisson peut constituer une bonne source d'énergie pour le corps.

Mots-clés : Noni, Jacquier, Dattes, Évaluation Proximale et Sensorielle.

تتوفر الفواكه الطازجة موسمياً وتتيح معالجتها إتاحتها طوال العام... يمتزج مستخلص الفاكهة مع التمر والجاك فروت لإنتاج العصير ومشروبات الفاكهة وهو بديل مناسب لاستخدامه لذلك، أجريت الدراسة لتقييم التركيب الكيميائي ومقبولية مشروبات الفاكهة المصنوعة من نوني والتمر والجاك فروت. تم الطازجة من حديقة نباتية تابعة لمؤسسة الرعاية الصحية الخضراء وحددها خبير تصنيف نباتي مؤهل. تم Jackfruit و noni الحصول على فاكهة تم غسل الثمار وتبريدها وتقطيعها إلى شرائح ونقعها/تجفيفها وطحنها وغربلها .Relief Market Owerri الحصول على فاكهة التمر من وتعبئتها في حاوية محكمة الإغلاق على التوالي تم استخدام الطرق القياسية لتحديد الخصائص القريبة والحسية لمزيج الفاكهة. تم مزج الثمار بنسبة 80:10:10، 70:15:15، 60:20:20، 100:0:0، على التوالي خضعت الخلائط للتحليل الكيميائي والتقييم الحسي. تم تحديد محتوى رطوبة

تم تحديد محتوى البروتين الخام بواسطة طريقة .AOAC (2016) باستخدام طريقة تجفيف الفرن D و C و B و A مشروبات الفاكهة AOAC من Soxhlex تم تحديد محتوى الدهون باستخدام طريقة استخراج AOAC (2016) كما وصفتها Micro Kjeldahl تم تحليل البيانات باستخدام النسخة 20.0 من .(2016)، AOAC كما تم تحديد الألياف الخام والرماد والكربوهيدرات باستخدام .(2016) المقبولة كمستوى من الأهمية تراوحت نسبة الرطوبة في عينات مشروبات الفاكهة من 59.23٪ (مشروب الفاكهة ج) إلى $p < 0.05$ و SPSS تراوح محتوى الدهون من 1.50٪ من (D العينة)إلى 0.20٪ B 94.34٪ لمشروب الفاكهة د. تراوح محتوى الألياف الخام من 0.09٪ للعينة عند ($p > 0.05$) مختلفًا بشكل كبير C كان محتوى الدهون من مشروب الفاكهة .C إلى 4.48٪ من مشروب الفاكهة D مشروب الفاكهة .($P < 0.05$) مختلفًا بشكل كبير B ومشروب الفاكهة A لم يكن محتوى الدهون من مشروب الفاكهة A, B and D مقارنته بمشروب الفاكهة تراوح رماد العينات من 0.29٪ لمشروب .C إلى 5.07٪ من مشروب الفاكهة B و A تراوح محتوى البروتين من 1.05٪ من مشروب الفاكهة إلى D تراوح محتوى الكربوهيدرات في عينات مشروبات الفاكهة من 2.45٪ لمشروب الفاكهة .C إلى 1.07٪ لمشروب الفاكهة B الفاكهة تم قبول جميع العينات. (التركيب القريب لمشروبات الفاكهة كشفت عن رطوبة عالية وكمية جيدة من الألياف الخام A 29.96٪ لمشروب الفاكهة والبروتين والرماد وقلة الدهون). تظهر كمية الكربوهيدرات والبروتين أن المشروب يمكن أن يكون بمثابة مصدر جيد للطاقة للجسم

Introduction

Fruit is generally the fleshy, sweet and edible part of fruit bearing plants which houses the seeds (Mauseth *et al.,* 2021). Fruits are essential part of human diet and food supplement. Fruits vary in sizes and shapes; contain reasonable amounts of micronutrients such as vitamins, minerals, dietary fibres and other bioactive compounds (Krystyna *et al.,* 2021). Consumption of fruits rich in several bioactive compounds has led to the reduction of several non-communicable diseases such as certain types of cancer, inflammation, cardiovascular diseases, cataracts, macular degeneration, and neurodegenerative disease and others. This evidence shows the importance of several nutrients in fruits for human health (Clerici, and Carvalho-Silva, 2011). They are good sources of essential elements needed by the body to function properly, such as water, vitamins, minerals and organic compounds. Fruits provide vitamins, minerals, antioxidants high enough to meet the bodies' daily requirement (Mauseth *et al.,* 2021).

There are numerous and widely distributed group of substances found in fruits and plants which phytochemical constitute one of them. Colourful fruits contain hundreds of phytochemicals that work together with nutrients to promote health and prevent diseases (Mahattanatawee *et al.,* 2006).

Among the important bioactive compounds are alkaloids, flavonoids, tannins and phenolic compounds. All these bioactive compounds have different mechanisms of actions in the body, including antioxidants effects, modulation of detoxification enzymes, stimulation of immune system, modulation of hormone metabolism, antibacterial and antiviral effect (Prior *et al.,* 2013). Phytochemicals gives fruits distinctive color, smell and

taste (Aneja *et al.,*2014). Photochemical also indicate the health of the plant as well as when it is ready to be eaten and which nutrient may be present (Yang *et al.,* 2020). Recently, consumption of tropical fruit is increasing, which may be associated with its therapeutic value in maintaining health and improving dietary diversity. The consumption of fruit is not just for a taste but, because of its overall contribution to our health due to the nutrient contents. Fruits constitute an important part in our diet (Mahattanatawee *et al.,* 2006).

Fruits such as noni, jack fruit, date, pineapple, orange, apple, grape juice and others can be processed as fruit juice or fruit drink, alcoholic beverage such as wine, brandy or vinegar, concentrated form, powdered beverage and smoothies (Shilpa *et al.,* 2013).

Juices can be prepared by squeezing fresh fruits mechanically or by enzymatic extraction process (Joanne and Beate, 2012). Juices are less fatty, nutrient dense beverages rich in vitamins, minerals and naturally occurring phytonutrients that contribute to healthy life. Natural fruit drinks promote detoxification in the human body (Minich and Bland, 2013).

Then the composite blend might be of a better nutritional quality. Fruit juice provided under hygienic condition could play an important role in enhancing consumer's health by increasing the micronutrients that the body needs (Sanez, 2001). The present study is aimed at developing noni fruit juice blended with date and jack fruit that will be of highly acceptable. Furthermore, the nutritional and the chemical characteristics of the developed blended drinks will be also evaluated.

Fresh fruits are seasonally available and processing enables them to be available all year round (Chang *et al*., 2016). There is limitation in the consumption of Noni fruit extract (*Morinda Citrifolia Linn*.), which is claimed to have high health benefits and high medicinal purpose. Its strong pungent flavour, sour taste and turbid nature is a challenge to its use. Another major challenge is the inadequate knowledge on the appropriate method of processing of the noni plant materials to reduce possible unacceptable flavour to produce quality healthy drinks. The presence of volatile compounds such as octanoic, hexanic acid and 3-methyl-3buten-1-ol (Potteratand Hamburger, 2007) are responsible for the strong flavour. Hence, it is a challenge task to prepare fruit drinks from noni fruit that will be healthy and sweet. For this reason, noni fruit extract blend with date and

jackfruit to produce smoothie, fruit drinks and concentrate is a convenient alternative for its utilization. This will be value added fruit drinks which will be of high quality in respect of aroma and nutritionally acceptable.

Based on these challenges in consumption of noni fruit drink, the manufacturers take advantage of it to add all sources of additives to entice the consumers. And such practices might be detrimental to health. Most of the manufacturers are only interest is to make money, not to consider the health consequence. This is why most of the noni fruit drinks found today in the market are mislabeled, adulterated and of inferior quality. Fruit drinks that are supposed to support healthy living have turn to junk food. And might finally lose its value for healthiness and put into the category of fizzy drinks. Thus the calls for a need to produce healthy fruit drinks with our locally available fruit that will be of health benefits to consumers. This can be achieved by blending noni, date and jackfruit fruit in order to produce good quality fruit drink with acceptable flavor and taste.

Moreover, the consumption of fruit drinks is becoming popular in Nigeria and the world at large. This work is therefore aimed at producing a healthy sweet drink.

Materials and method

Freshly matured noni and Jackfruit were sourced from Green Healthcare Foundation Botanical Garden Imo state and identified by a qualified plant taxonomist. Date fruit was sourced from Relief Market Owerri.

Sample Preparation - Noni

A matured fresh fruit of noni was plucked, washed with clean water to remove surface pollutants. The fresh fruits were allowed to dry water and then kept in a protected room at room temperature for 24 hours to soften after which it was cut into pieces to remove the seeds and grind with electric blender. The fresh juice was packaged in an air tight container, labeled, stored in a cooler packed with ice block before used for analysis. The method used Codex Alimentarius (International Food Standard) on General standard for fruit juices and nectars Cxs 247-2005. The flow chart is shown in Figure 1.

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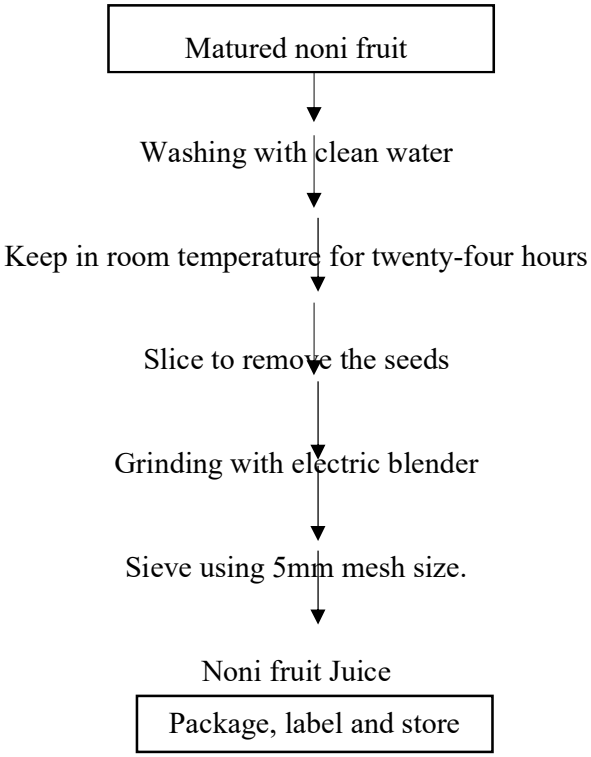

Figure 1: Flow chart for preparation of Noni fruit juice sample.

Preparation of Date fruit

Date fruit was rinsed with water and deseeded. It was soaked in water for 4hrs, milled with electric blender and sieved using 5mm mesh size sieve to obtain the date fruit juice. It was packaged in an air tight container until analysis. The flow chart is shown in Figure 2.

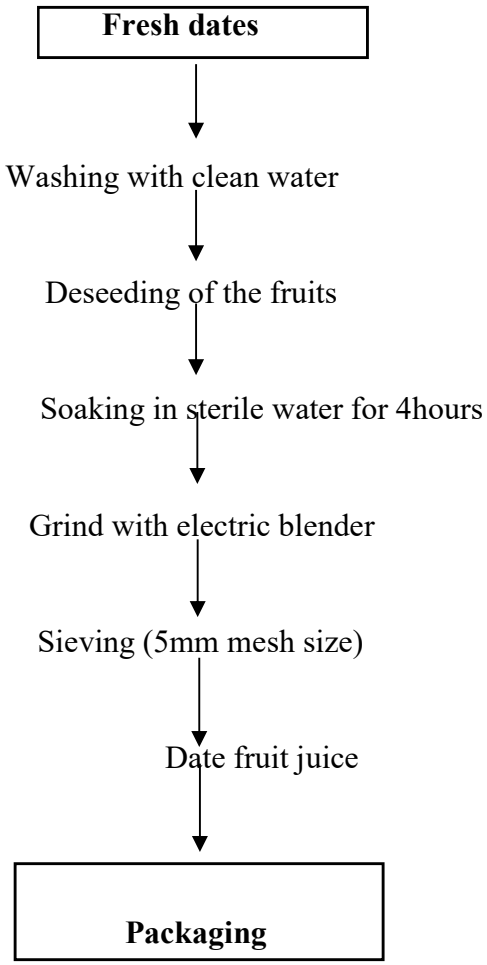

Figure 2: Flow Chart for preparation of date fruit juice.

Preparation of Jackfruit

The jackfruit pulp was separated from the seed using sterile knife and sliced into pieces. The sliced pulp was ground using a machine blender, it was sieved to obtain the jack fruit juice and was later packaged. The flow chart is shown in Figure 3.

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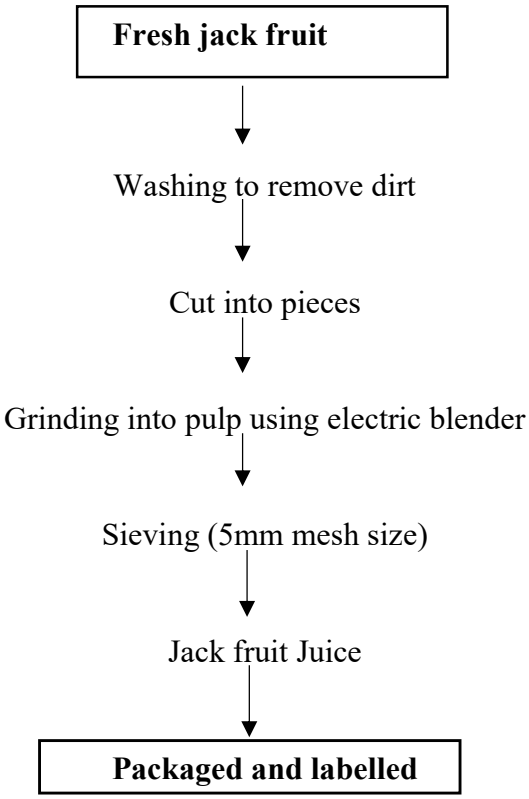

Figure 3: Flow chart for preparation of jackfruit.

Formulation of Fruit Blends from Noni fruit, Jack fruit and Date fruit

Fruit drink A = 80% Noni: 10% Date : 10% Jackfruit juice

Fruit drink B = 70 % Noni: 15%Date : 15% Jackfruit juice

Fruit drink C = 60% Noni : 20% Date:20Jackfruit juice

Fruit drink D = 100% Noni (Control)

Result

Table 1 shows the proximate composition of fruit drinks from blends of Noni, Date and Jack fruit.

It was observed that there was a significant difference ($p<0.05$) in moisture content of the fruit drinks. The moisture content of the fruit drinks samples ranged from 59.23% for fruit drink C to 94.34% of fruit drinks D while there was no significant difference ($p>0.05$) in crude fiber content of the fruit drinks. Crude fiber content ranged from 0.09% for fruit drink B to 0.20% of fruit drink D. Results also revealed a significant difference ($p<0.05$) in fat and protein content of the fruit drinks. Fat content ranged from 1.50% for fruit drink D to 4.48% of fruit drink C, while protein content ranged from 1.05% of fruit drink A and B to

5.07% of fruit drink C. No significant difference ($p>0.05$) was observed in the ash content of fruit drinks. The increase in carbohydrate content of the fruit drinks samples from 2.45% for fruit drink D to 29.96% for fruit drink C was significant ($p<0.05$) due to the increase in dates and jack fuits.

Table 1: Proximate composition of fruit Drinks from blends of Noni, Date and Jack fruit.

	Sample means and deviations				
Analysis (%)	**Fruit drink A**	**Fruit drink B**	**Fruit drink C**	**Fruit drink D**	**LSD**
Moisture content	$92.94^{b}\pm0.41$	$65.18^{c}\pm0.12$	$59.23^{d}\pm0.06$	$94.34^{a}\pm0.03$	0.2169
Crude fiber	$0.21^{a}\pm0.03$	$0.09^{a}\pm0.00$	$0.16^{a}\pm0.10$	$0.20^{a}\pm0.03$	0.2169
Fat	$2.75^{b}\pm0.07$	$2.51^{c}\pm0.34$	$4.48^{a}\pm0.06$	$1.05^{c}\pm0.00$	0.2169
Protein	$1.05^{c}\pm0.07$	$3.67^{b}\pm0.24$	$5.07^{a}\pm0.24$	$1.05^{c}\pm0.00$	0.2169
Ash	$0.47^{b}\pm0.31$	$0.0.29^{a}\pm0.29$	$1.07^{a}\pm0.48$	$0.89^{a}\pm0.49$	0.2169
Carbohydrate	$2.65^{c}\pm0.01$	$28.24^{b}\pm0.05$	$29.96^{a}\pm1.02$	$2.45^{d}\pm0.42$	0.2169

Mean values having different superscripts along the same column are significantly different ($P<0.05$).

Fruit drink A = 80% Noni: 10% Date: 10% Jackfruit drinks
Fruit drink B = 70 % Noni: 15% Date: 15% Jackfruit drinks
Fruit drink C = 60% Noni: 20% Date: 20Jackfruit drinks
Fruit drink D = 100% Noni (Control)
LSD =Least significant difference.

Table 2 shows the sensory properties of fruit drinks from blends of Noni, Dates and Jack fruit.

The sensory evaluation results showed that the appearance of the samples ranged from 5.30 for fruit drink D to 8.35 for fruit drink C. Taste of the fruit drinks ranged from 6.20 for fruit drink D to 9.00 for fruit drink C. Aroma of the fruit drinks ranged from 6.85 for fruit drink D to 8.85 for fruit drink C. Mouth feel of the fruit drinks ranged from 5.00 for fruit drink D to 8.35 for sample A. Overall acceptability of the fruit drinks ranged from 5.40 for fruit drink D to 9.00 for fruit drink C.

Sensory evaluation results (Table 2) showed that, fruit drink C had the highest mean scores in appearance, taste, aroma, mouth feel and overall acceptability. It was revealed that the increase in dates and jackfruit in fruit drink C could be the reason behind the increase in the scores of fruit drink C.

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Table 2: Sensory properties of fruit Drinks from blends of Noni, Date and Jack fruit

Samples	Appearance	Taste	Aroma	Mouthfeel	Overall acceptability
Fruit drink A	$7.00^{c} \pm 0.75$	$6.90^{c} \pm 0.77$	$7.20^{c} \pm 1.01$	$6.55^{c} \pm 0.76$	$6.25^{c} \pm 1.02$
Fruit drink B	$7.25^{b} \pm 0.91$	$7.60^{b} \pm 1.05$	$7.50^{b} \pm 0.92$	$7.10^{b} \pm 0.96$	$7.45^{b} \pm 1.15$
Fruit drink C	$8.35^{a} \pm 1.04$	$9.00^{a} \pm 1.05$	$8.85^{a} \pm 1.14$	$8.35^{a} \pm 0.93$	$9.00^{a} \pm 1.03$
Fruit drink D	$5.30^{d} \pm 1.03$	$6.20^{d} \pm 1.02$	$6.85^{d} \pm 1.27$	$5.00^{d} \pm 1.04$	$5.40^{d} \pm 1.39$
L.S.D	**0.268**	**0.286**	**0.312**	**0.273**	**0.329**

Mean values having different superscripts along the same column are significantly different ($P < 0.05$)

Fruit drink A = 80% Noni: 10% Date: 10% Jackfruit drinks
Fruit drink B = 70 % Noni: 15% Date: 15% Jackfruit drinks
Fruit drink C = 60% Noni: 20% Date: 20Jackfruit drinks
Fruit drink D = 100% Noni (Control)
LSD =Least significant difference.

Discussion

The Proximate analysis estimates and determines the major components which include moisture, fats, proteins, ash, crude fiber in a given food (Rajamohamed, 2003). The moisture content of the samples was significantly different ($P \leq 0.05$). Methods used in the production of the fruit drinks led to the variation in the moisture content of fruit drink D. All the fruit drinks are pulpy which could have contributed to the high moisture content of the fruit drinks, but due to the nature of fruit drink D, more water was added to enable easy extraction of fruit drink D which led to the high moisture content in fruit drink. This a huge factor to consider in processing of fruit drinks to reduce fruit drink spoilage, (Lawal *et al.,* 2016). The high moisture content in the fruit juice are in agreement with the report of USDA ,(2008) which reported that moisture content in papaya fruit drinks were as high as 85 – 92%. The high moisture content in fruit drink D content of 94.34 % may have a faster tendency to acquire microbial growth. This was also reported by Ponnusha *et al.* (2011) which stated that high moisture content has increased susceptibility for microbial activity. Therefore, rapid control measures should be applied to prevent microbial attack (Lawal *et al.,* 2016). However, the loss of moisture as the fruits

ripen can increase the concentration of glucose which imparts on the energy value of the drinks (Nwanaekezi *et al.*, 2005).

Crude fibre content of the samples was not significantly different ($P \geq 0.05$). This could be due to production method of the fruit drinks because; the fibers were sieved out in order to get smooth fruit drink during the course of production. According to Adeleke and Abiodun (2010) fruit drinks are low in fibre due to the grinding and extraction processes the fruits are subjected. The crude fibre obtained from this research is higher when compared to the range 0.05% to 0.12% reported by (Ekpete *et al.,*2013) in proximate and mineral composition of some Nigerian fruits. Generally, fruits and leaf are good source of dietary fibre because of their reasonable crude fiber contents. Evidence has shown that consumption of reasonable amount of fiber lowers the risk of coronary heart disease, obesity, bowel cancer and type II diabetes mellitus (Theuwissen and Mensink, 2008).

Fat content of fruit drink C was significantly different from fruit drinks A, B and D. The variation in the fat content of fruit drink C may be as the result of increase in the percentage of jackfruit and date juice. According to Ekpete *et al.* (2013), fat content of fruit drink samples using jack fruit and pineapple gave a fat content of 2.60% to 4.90%. Results from this study, were within the same range. Generally, fruits are low in fats and good for people on low fat diet. Lipids are also found in some fruits as they provide maximum energy and facilitate intestinal absorption and transportation of fat-soluble Vitamins (A, D, E, and K) and carotenoids (Ekpete *et al., 2013*).

Proteins, play vital role in biological processes, are responsible for transportation of molecules, oxygen and messages from cell to cell and keeps human body healthy (FAO, 2013). Protein in this study is moderately high. This is in agreement with the study of Chunhieng (2003) who reported a protein content of 11.3% in the fruit juice of *M citrifolia.* This indicates that some fruits have appreciable level of proteins. Proteins are essential component of diet needed for survival of livestock and man. Their basic function is to supply amino acids required for growth. Their deficiency causes growth retardation, muscle wasting, oedema, belly swelling and collection of fluids in the body (Ekpete *et al.,* 2013).

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Ash of the samples ranged from 0.29% for fruit drink B to 1.07% for fruit drink C. The ash content results were higher compared to 0.24% to 0.92% reported by (Lawal *et al.,* 2016) in Phytochemical screening and in vitro anti-bacterial studies of the ethanolic extract of *Citrus Sinensis* peel against some clinical bacterial isolates. The result showed that the consumption of the fruit drink C will help to supply adequate amount of amino acids to the body (Obasi, 2014).

Ash also found in fruits content is a measure of mineral content of the original food (Onwuka, 2005); this is important because high percentage of ash is contained in high mineral concentration that catalyzes metabolic processes, and improves growth and development (Lawal *et al.,* 2016). Some fruits, leafy vegetables, seeds and stem bark of a plant have appreciable content of ash for example in *Gamelina arborea* fruit and vegetable (Lawal *et al.,* 2016).

Carbohydrate content of the fruit drinks of fruit drinks B and C were significantly higher than in fruit drinks A and D. This indicates that the samples with high percentage of date and jackfruit contain higher carbohydrate content. Our study agrees with Mohamed *et al*. (2015) who reported high carbohydrate content of date. According to (Obasi, 2014) high carbohydrate content of a food material is an indication of high energy in the food. Fruits carbohydrates could be used to supplement for cereal to avoid carbohydrate deficiency which can cause depletion of body tissue and lead the body to use protein as energy source (Ekpete *et al.,* 2013). Aberoumand, (2011) who reported high carbohydrate contents in fruits of *Myrtuscommunis* and *Cordiamyxa* while Vunchi *et al.* (2011) also reported that most fruits have high carbohydrate contents depending on the fruit type, maturity and environment. Carbohydrates play several vital roles in living organisms and they can be oxidized to yield energy while their polymers act as energy storage molecules (Lawal *et al.,* 2016). Fruit drink can serve as food to sick people who may find swallowing difficult to provide them with the needed energy to maintain life processes.

Sensory properties of the fruit drinks samples revealed that appearance of the samples ranged from 5.30 for fruit drink D to 8.35 for fruit drink C. Appearance of a food sample is an important sensory attribute a food product must possess because of its influence on a consumer acceptability of food products (Falola,

2012). Taste of the samples ranged from 6.20 for fruit drink D to 9.00 for fruit drink C. Aroma of the samples ranged from 6.85 for fruit drink D to 8.85 for fruit drink C. Mouth feel of the samples ranged from 5.00 for fruit drink D to 8.35for fruit drink A. Mouth feel measures the degree of smoothness and roughness of a food drinks during consumption. In overall acceptability of the mixed fruit drinks, fruit drink C (60% Noni: 20% Date: 20Jackfruit drinks) had the best sensory properties in terms of appearance, taste, aroma, mouth feel and Overall acceptability due to its high sensory scores and percentage of the blends.

Conclusion

(The study evaluated the chemical composition and acceptability of fruit drinks made from Noni, date and jackfruits. The results showed that blend of Noni, date and jack fruit have high nutritional value which help to supply micro and macro-nutrients that the human body requires to reduce malnutrition. Proximate composition of the samples revealed that fruit drinks have high moisture, good amount of crude fiber, low fat, protein and ash. The amount of carbohydrate and protein content in the fruit drinks shows that the drink can serve as good source of energy for the body. Sensory properties /acceptability of the fruit drink samples revealed that fruit drink C (60%Noni:20%Date and 20% Jack fruit) could be recommended due to its high sensory acceptability values in terms of appearance, taste, aroma, mouth feel and overall acceptability).

References

Aneja, K. R.,Dhiman, R., Aggarwal, N. K., Kumar, V,and Kaur, M. (2014) Microbes Associated with Freshly Prepared Juices of Citrus and Carrots. *International Journal of Food Science.*

Mauseth, J. D. (2021). Botany Introduction to Plant Biology. Seventh Edition. Jones and Bartlett learning, CA USA.

Minich, D.M and Bland, J. S (2013). Personalized Lifestyle Medicine: Relevance for Nutrition and Lifestyle Recommendations. *The Scientific World Journal*

Prior, T.,Wäger, P.A., Stamp, A.,Widmer, R. and Giurco, D. (2013). Sustainable governance of scarce metals: The case of lithium. *Science of the Total Environment, STOTEN*-14799,.7.