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Comparative Analysis of Water in Tender and Matured Coconut Fruits and Use as Oral Rehydration Solution

Adesakin Adetayo (Corresponding Author)
Research and Development Department, Engineering Materials Development Institute ,P.M.B 611 Akure, Nigeria
E-mails: adextayolet@yahoo.com

Akinloye Oluwakemi
Nursing dept., Ladoke Akintola University, Ogbomoso Nigeria
E-mails: kemgnes@yahoo.co.uk

Omidiran Yinus
Science Laboratory Technology Department, Federal Polytechnic Ede, Osun State, Nigeria

Abstract
In this research, comparative analysis of the amount of sodium, chloride and glucose present in coconut water of both tender and matured coconut fruits were done and compared with that of commercially available oral rehydration salt. Sodium in combined state, as sodium chloride is an active element for rehydration. It has ability to absorb water into the gut mucosa and aid the flow of fluid back into the body. Amount of sodium was determined using Flame emission Spectrophotometer. Chloride was determined by Mohr's titration method and amount of glucose was determined using Lane and Eyon titration method. The result of the analysis revealed the potency of coconut water as a readily available oral rehydration solution for oral rehydration therapy. The tender coconut is most suitable, having relatively close amount of sodium, chloride and glucose with that of the commercially available salt. The mature coconut has higher concentration of glucose compare with that of commercially available oral rehydration salt
Keywords: Flame Emission Spectrophotometer, Coconut water, Oral Rehydration Solution, Titration methods.

1.1 INTRODUCTION

In recent years, diarrhoea has being one of the major causes of infant mortality. The main cause of diarrhoea is poor sanitation and contamination of food, especially in unhygienic environment. Diarrhoea which is passage of abnormal watery stools, has been reported to cause death fairly quickly and particularly among children under five years old (Kingpin (2005).

In most acute diarrhoea, electrolyte such as chloride and sodium besides water are actively secreted from the gut mucosa and thus lost in stools. It has being observed that while water and sodium were being lost, nutrients such as glucose, amino acids and dipeptides continued to be absorbed into the body as an active enzyme mediated (Kingpin (2005).

If an isotonic-osmolar solution of glucose and sodium is given orally, glucose and sodium are absorbed. Sodium absorption also promotes absorption of water. This is the physiological basis of oral-rehydration therapy, which is fascinating advancement of modern medicine and has probably saved more lives than any other treatment modality.

In view of the deadly nature of the dehydration, which may be as a result of diarrhoea or excessive exercise, there is need for first aid measure to rehydrate the lost water in the body. Intravenous (IV) fluid, which would have being the classic approach to dehydration, is posed with problem of expertise and at the same time expensive. Oral rehydration solution can be highly effective, inexpensive and uncomplicated treatment for most forms of dehydrated. It requires no specialized skills or equipment uses ingredients that are ubiquitous and has a low risk of complications.

Coconut water has being reported to be a natural isotonic beverage, with the same level of electrolytic balance as we have in our blood. During the pacific war of 1941-45, both sides in the conflict regularly used coconut water-siphoned directly from the nut to give emergency plasma transfusion to wounded soldiers (Duke, J.A. and Ducellier J.L, 1993).

Coconut palm, Cocos nucifera L, is commonly found across the southern part of Nigeria, especially the coastal area. It has being found out that the electrolyte concentration and volume of water in the coconut fruit depend on the age of the fruit (Harries H.C 2001). For an ordinary man in Nigeria, the use of appropriate fruit may not be taking into consideration. It is therefore important to ascertain the specify type based on age of the Coconut fruit to be used for oral rehydration therapy.

This research is aimed at examining the usage of Coconut Water as a readily available material for an emergency means of rehydration and being able to ascertain the specific Coconut fruit to be used even by

common people.

1.1.1 EXPERIMENTAL PROCEDURE

SAMPLE COLLECTION

Both the mature and tender coconut fruits were plucked and collected from the coconut tree for the analysis.

SAMPLE PREPARATION

The Coconut fruit were dehusked properly with the use of knife. The unplugged germ pore at the proximal end of the Coconut was pinched with the knife, so as to drain out the liquid. The volume and pH of the liquid were taken.

PREPARATION OF COMMERCIALLY AVAILABLE ORAL REHYDRATION SOLUTION (STANDARD)

One sachet of the commercial oral rehydration salt, which is 22g, was dissolved in 1litre of distilled water.

DETERMINATION OF CHLORIDE CONTENT OF COCONUT WATER USING MOHR'S TITRATION METHOD

2ml of the coconut water was taken into 50ml volumetric flask and was made up to mark with distilled water. 25ml of the sample solution was titrated with 0.1M solution of sliver nitrate in the presence of potassium chromate indicator.

The solution was swirled constantly until the red colour formed by the addition of each drop began to disappear more slowly: This was an indication that most chloride has been precipitated. The addition was continued until faint but distinct colour change occurs from yellow to brick red with white precipitate. The average titre value of the titration was used to calculate the concentration of chloride precipitated by sliver nitrate.

DETERMINATION OF SODIUM CONTENT OF COCONUT WATER USING FLAME EMISSION SPECTROPHOTOMETER

The coconut water was firstly put into centrifuge for spinning and filter, so as to obtain a supernatant solution. This was done at 1000 revolution for 10minutes. 10ml of the clear was digested with 1% v/v Nitric acid in 50ml volumetric flask and made up to mark with the acid. The solution was then taken into flame emission spectrophotometer to determine the amount of Na^+ present in the solution.

DETERMINATION OF GLUCOSE CONTENT OF COCNUT WATER USING LANE AND EYON METHOD

The determination was done according to Vogel A.J. (1960) procedure. Equal proportion of Fehling's solution A and B were mixed together in a beaker. 10ml of the mixed Fehling's solution was pipette into a conical flask and was titrated with the sample solution. The sample solution was added to the Fehling's solution from the burette. The titrated solution in the conical flask was heated on the heating mantle as the titration continues.

Four drops of methylene blue solution was added after the liquid had boiled moderately for 1½ minute. The sample solution was added at a rate of 0.25ml per 15seconds and was completed within 3minutes from the commencement of boiling. The titration was carried out thrice in order to obtain an average titre value.

1.1.2 RESULT AND DISCUSSION

The results of the analysis were presented in the tables below. Table 1, 2, 3 and 4 contains the chloride, glucose, sodium concentration and the overall summary respectively.

According to the result of the analysis it was discovered that the tender coconut water contains 1.5504mg/100ml, the matured coconut water contains 2.0672mg/100ml and the commercial oral rehydration salt contains 1.7316mg/100ml of chloride.

The amount of glucose in tender coconut water is 147.25mg/100ml; matured coconut water is 154.32mg/100ml and the commercial oral rehydration salt contains 148.05mg/100ml.

Tender coconut contains 212.50mg/100ml of sodium; matured coconut contains 80.70mg/100ml of sodium while the commercial oral rehydration salt contains 204.0mg/100ml. The tender coconut has a relatively close amount of sodium with that of rehydration salt while the matured coconut water has lowest concentration of sodium.

The major constituents for oral rehydration are sodium and glucose. The sodium which cannot exit alone in Free State, occur in combine state as sodium chloride.

Comparing the amount of sodium and glucose in tender and matured coconut water with that of commercially available oral rehydration salt, the tender coconut water has a relatively close value with that of the rehydration salt, while the matured one has higher value of glucose and lower value of sodium compare to that of the oral rehydration salt.

The matured coconut water has highest concentration of glucose content and lowest concentration of sodium content. This may be as result of ageing as the coconut fruit becomes mature; there is decrease in volume of water with reduced concentration of glucose.

1.1.3 CONCLUSION

The result of this analysis has shown the importance of coconut water, especially tender coconut, as a readily available material for oral rehydration therapy and as a substitute for commercially available oral rehydration salt. Its sterile state makes it easier for it to be used as an emergency and first aid treatment in regaining the loss body fluid.

For a common man, the matured coconut water with higher concentration of glucose will not be suitable enough for rehydration due to high level of glucose in it. High intake of glucose can cause diabetes.
During the analysis, it was observed that the samples undergo fermentation after two days at room temperature in the presence of air. This confirms the presence of yeast, which bring about fermentation. It is therefore necessary for the coconut water to be prepared and consumed by the patient within one day before fermentation.

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Table1.The average titre value of the chloride in all the samples

Samples	Average Chloride Value Mg/100ml
Tender Coconut	1.5504
Matured Coconut	2.0672
Commercial oral rehydration salt	1.7316

Table2.The average titre value of the Glucose in all the samples

Samples	Average glucose Value Mg/100ml
Tender Coconut	147.25
Matured Coconut	154.32
Commercial oral rehydration salt	148.05

Table3.The value of the sodium in all the samples

Samples	Emmittance	Mol/100ml	Mg/100ml
Tender Coconut	0.50	0.0250	212.5
Matured Coconut	0.40	0.0095	80.7
Commercial oral rehydration salt	0.49	0.0240	204.0

Table4.The summary of the results of all the samples

Samples	Chlorides Mg/100ml	Glucose Mg/100ml	Sodium Mg/100ml	pH
Tender coconut	1.5504	147.25	212.50	5.28
Matured coconut	2.0672	154.32	80.70	5.80
Commercial Oral rehydration salt	1.7316	148.05	204.00	7.40

ABOUT THE AUTHORS

A.O. Adesakin is an officer in the research and development department of Engineering Materials Development Institute, Akure Nigeria. He holds a Higher National Diploma (HND) in Applied Chemistry and Post Graduate Diploma (PGD) in Industrial Chemistry. He is presently doing his Master's in Industrial Chemistry (M-Tech) at Federal University of Technology, Akure Nigeria. He is a member of Institute of Chartered Chemists of Nigeria (ICCON), Chemical Society of Nigeria (CSN) and Material Society of Nigeria. His research interests are in Materials synthesis and Characterization, Micro analysis, Polymer-composite and Nanotechnology.

A.O. Akinloye is a registered basic nursing officer with the Nigerian nursing council. She is presently at final stage of her bachelor of Nursing programme (Bsc Nursing) at the Ladoke Akintola University, Ogbomoso Nigeria.

Y.A Omidiran is a principal lecturer of Chemistry at the department of science laboratory technology, Federal Polytechnic Ede, Osun State, Nigeria. He specialised on inorganic chemistry.

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