ELECTROLYTE CONCENTRATIONS IN APPARENTLY HEALTHYINDIVIDUALS AFTER CONSUMPTION OF AQUEOUS EXTRACT OF *Jatropha tanjorensis*

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ABSTRACT

Jatropha tanjorensis is a herbaceous plant use locally for the treatment of diabetes, inflammation, and stomach ache in Nigeria. Long time effect of *Jatropha tanjorensis* on electrolyte concentrations in the body is yet to be determined. This study was conducted to determine electrolyte concentrations in apparently healthy individuals after consumption of aqueous extract of *Jatropha tanjorensis*. 7 apparently healthy individuals aged between 23-26 years, weighing 44-75kg were recruited for the study. Blood samples were collected before commencement of the study as control samples while test samples were collected on the 7th and 14th day of consumption of 7.8g/175ml of *Jatropha tanjorensis* daily for 14 days. Electrolyte was estimated using ion selective electrode. The result showed that sodium ($p<0.05$), potassium ($p<0.05$), chloride($p<0.05$), bicarbonate($p<0.05$) and Anion gap($p<0.05$) were significantly lower after 7 days of consumption of aqueous extract of *Jatropha tanjorensis* when compared to results before consumption of the extract. However, after 14 days of consumption of *Jatropha tanjorensis* aqueous extract, sodium and bicarbonate were lower ($p<0.05$) when compared to values before consumption. The results of this study suggest that *Jatropha tanjorensis* aqueous extract predispose consumers to electrolyte imbalance and metabolic acidosis.

KEYWORDS: *Jatropha tanjorensis*, Electrolytes, Sodium, Potassium, Chloride, Bicarbonate

INTRODUCTION

Medicinal plants in form of herbs have been used in different parts of the world as traditional herbal remedies [1]. *Jatropha tanjorensis*is one of such medicinal plants which is from euphorbiaceae family and commonly called "hospital too far" among the local users[2]. Phytochemical Screening *of Jatropha tanjorensis* leaves revealed that it contains bioactive substances such as alkaloids, flavonoids, tannins, cardiac glycosides, antraquinones and saponins [3]. Reports showed that the administration of *Jatropha tanjorensis* leaves to humans resulted in the improvement of their hematological indices, which revealed an enhancement of bone marrow functions [4],while Some researchers claim that the plant is toxic to the different organs in the human body [3]. Nutritionally, the leaves of *Jatropha tanjorensis* are locally

consumed as vegetables [4]. The leaves also serve for medicinal purposes, as they are used for the treatment of fevers, itches, sores on the tongues of babies, stomach ache, eczema, cabuncles and venereal diseases [5]. The Leaves of *Jatropha tanjorensis* has been used as a vegetable and also for the treatment of diabetics in southern parts of Nigeria [6]. The leaf extract has been used as an anticoagulant for biochemical and hematological analysis [5].

Electrolytes are substance that become ion in solution and acquire the capacity to conduct electricity. All life form require a complex balance of electrolyte inside and outside the body structure. In humans this balance is regulated by hormones and the disruption of this balance leads to health problem [7].The primary ions of electrolytes are sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), chloride (Cl^-) and the bicarbonate (HCO_3^-) [7].

The maintenance of precise osmotic gradient of electrolyte is important, since electrolyte gradient affect and regulate the hydration of the body, blood pH and are critical for nerve and muscle functions[7]. Muscles and neurons are activated by electrolyte activity between the extracellular fluid and intracellular fluid. Electrolytes may enter or leave the cell membrane through specialized protein structures embedded in plasma membrane called ion channel [7].

Electrolyte balance may be maintained by oral or intravenous intake of electrolyte containing substances and it is regulated by hormones such as antidiuretic hormones, aldosterone and parathyroid hormone. Serious electrolyte disturbance such as dehydration and over hydration may lead to cardiac and neurological complications and medical emergency. Electrolyte disturbance can also cause muscle weakness or severe muscle contractions [7].

This study sought to determine electrolyte concentrations in apparently healthy individuals after consumption of a known concentration of aqueous extract of *Jatropha tanjorensis* leaves for a period of seven (7) and fourteen (14) days.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Rivers State College of Health Science and Technology, Port Harcourt metropolis, Rivers State Nigeria.

2.2 Study Population

A total of 7 apparently healthy individuals aged between 23-26 years and weighing 44-75kg were recruited for the study. The 7 individuals used for the study were volunteers who gave informed consent to participate in the study. Each participant was duly informed about the research before obtaining formal consent.
Each participant's anthropometric data which included weight, age, sex were documented.

2.3 Plant Material / Plant preparation

The Plant use for the study was gotten from Igwuruta in Rivers State, Port Harcourt Nigeria. The plant material was identified by the Pharmacist in the pharmacy Laboratory in the Rivers State College of Health Science and Technology, Port Harcourt. The leaves of *Jatropha tanjorensis* was the plant part used for the study. The leaves of the plant *Jatropha tanjorensis* was carefully plucked off or detached from the branches and washed to remove dirt on the surface of the leave. The leaves were weighted (LW) and ground to tiny bits and were squeezed to obtain the juice. The part left after removal of the juice was weighted and labeled as SW. Weight of *Jatropha tanjorensis* in the juice was calculated as follows:

Weight of *Jatropha tanjorensis* in extract (g) = LW -SW

7.8g/175ml of *Jatropha tanjorensis* extract was given daily to each participant for fourteen (14) days. Blood samples were collected before the commencement of the study as control samples.

2.4 Experimental design / Sample collection

A total of seven (7) apparently healthy individual were used for the study. Blood sample were collected from these individuals before the commencement of the study into a lithium heparinized test tube which served as the control sample. The blood samples were taken to the laboratory for the analysis of sodium, potassium, chloride, bicarbonate and anionic gap. On the 7^{th} and 14^{th} day of commencement of the study, blood samples were collected by vein puncture from the antecubital vein. The skin was cleaned with 70% alcohol and allowed to air dry, a tourniquet was tightened on the hand above the site of puncture and disposable needle and syringe was used to collect 2ml of blood which was immediately dispensed into lithium heparin anticoagulated bottle that was labeled with the patients name, sex and age. Each sample was centrifuged at 1500rpm for 5 minutes and analyzed immediately using ion electrode analyzer.

2.5 Determination of Electrolyte

The Electrolyte concentration was determined using the ion selective electrode (ISE) machine, model ISE 4000, serial no 04020329.Paris France. The results were obtained in each case in triplicate measurements was validated by comparing the result with known values provided.

2.6 Principle of Electrolyte

An ideal ion selective electrode consists of a thin membrane which only the intended ion can be transported. The transport of ion from a high concentration to a low one through a selective binding with some sites within the membrane creates a potential difference.

2.7 Procedure

The **On** button at the back of the ion selective electrode analyzer was pressed, the analyzer was allowed to boot after which the rest **mode button** was pressed. The sample test number (GCT PAT) was entered the "**Yes**" button was pressed. The plasma was taken to the probe after which the RUN button was pressed, the screen display test in progress and display on the screen test in progress until the result is ready and display on the screen and was all printed out. The sample was removed after the "sample off" "beep" and the result was entered in the result book. The probe was flushed with distilled water after each run.

2.8 Statistical Analysis

Data obtained were analyzed using Excel and graph pad prism. P value <0.05 were considered statistically significant. Results are presented in mean ± standard deviation.

3. RESULTS

The study was conducted to determine electrolyte concentrations in apparently healthy individuals aged between 23-26 years, weighing 44-75kg after consumption of 7.8g/175ml of aqueous extract of *Jatropha tanjorensis.*

The results are summarized in table 1-3 and figure 1.

3.1 Electrolyte concentrations in control group and in test subject after consumption of *Jatropha tanjorensis* aqueous extract after 7 days

Table 1 showed that sodium, potassium, chloride, bicarbonate and anion gap were significantly lower ($p<0.05$) in test subjects that consumed 7.8g/175ml of *Jatropha tanjorensis* daily for 7 days than in control (before consumption of 7.8g/175ml of *Jatropha tanjorensis).*

Table 1: Electrolyte concentrations in control group and in test subject after consumption of *Jatropha tanjorensis* aqueous extract after 7 days (n=7)

Parameter	Control(before consumption) n=7 Mean ±SD	Test subject after 7days n=7 Mean ±SD	T.value	P.value
Sodium (mmol/l)	142.0±3.51	126.85±2.79	8.9829	0.0001
Potassium (mmol/l)	4.24±0.13	3.60±0.19	7.3203	0.0001
Chloride (mmol/l)	104.8±0.83	96.00±3.10	7.2732	0.0001
Bicarbonate(mmol/l)	23.85±2.84	16.14±2.00	5.8588	0.0001
Anion gap(mmol/l)	11.85±1.55	10.42±0.72	2.2137	0.0470

P<0.05 is considered significant

3.2 **Electrolyte concentrations in control group and test subject after consumption of *Jatropha tanjorensis* aqueous extract after 14 days**

After 14 days of consumption of *Jatropha tanjorensis*, result in Table 2 showed that sodium and bicarbonate were significantly lower (P<0.05)in test subjects that consumed 7.8g/175ml of *Jatropha tanjorensis* daily for 14days when compared to concentrations in control (before consumption of 7.8g/175ml of *Jatropha tanjorensis).*While potassium, chloride, bicarbonate and anion gap did not show any significant difference before and after consumption of the extract.

Table 2: Electrolyte concentrations in control group and test subject after consumption of *Jatropha tanjorensis* aqueous extract after 14 days (n=7)

Parameter	**Control(before consumption) n=7 Mean ±SD**	**Test subject after 14days n=7 Mean ±SD**	**T.value**	**P.value**
Sodium (mmol/l)	142.0±3.51	137.28±4.60	2.1582	0.0519
Potassium (mmol/l)	4.24±0.13	4.32±0.32	0.5738	0.5767
Chloride (mmol/l)	104.8±0.83	104.00±1.24	1.4185	0.1815
Bicarbonate(mmol/l)	23.85±2.84	19.14±2.40	3.3514	0.0058
Anion gap	11.85±1.55	12.28±1.20	0.5876	0.5677

P<0.05 is considered significant

3.3 Electrolyte concentrations in Test subject after consumption of *Jatropha tanjorensis* aqueous extract after 7 and 14 days

Table 3 shows the Comparism between test subjects after 7 days and 14 days of daily consumption of 7.8g/175ml of *Jatropha tanjorensis*. Results showed that potassium, sodium, chloride and anionic gap were significantly increased (P<0.05) after 14 days of consumption while bicarbonate did not show significant difference (p>0.05) after 7and 14days of consumption.

Table 3: Electrolyte concentrations in Test subject after consumption of *Jatropha tanjorensis* aqueous extract after 7 and 14 days (n=7)

Parameter	Test subject After 7 days n=7 Mean ±SD	Test subject after 14 days n=7 Mean ±SD	T.value	P.value
Sodium (mmol/l)	126.85±2.79	137.28±4.60	5.1292	0.0002
Potassium(mmol/l)	3.60±0.19	4.32±0.32	5.1638	0.0002
Chloride (mmol/l)	96.00±3.10	104.00±1.24	6.3394	0.0001
Bicarbonate(mmol/l)	16.14±2.00	19.14±2.40	2.5407	0.0259
Anion gap	10.42±0.72	12.28±1.16	3.6045	0.0036

P<0.05 is considered significant

3.4 Electrolyte concentrations on the 7th day and 14th day of consumption of *Jatropha tanjorensis* aqueous extract.

Figure **1** shows the different electrolyte concentrations on the 7th and 14th day after daily consumption of 7.8g/175ml of *Jatropha tanjorensis*

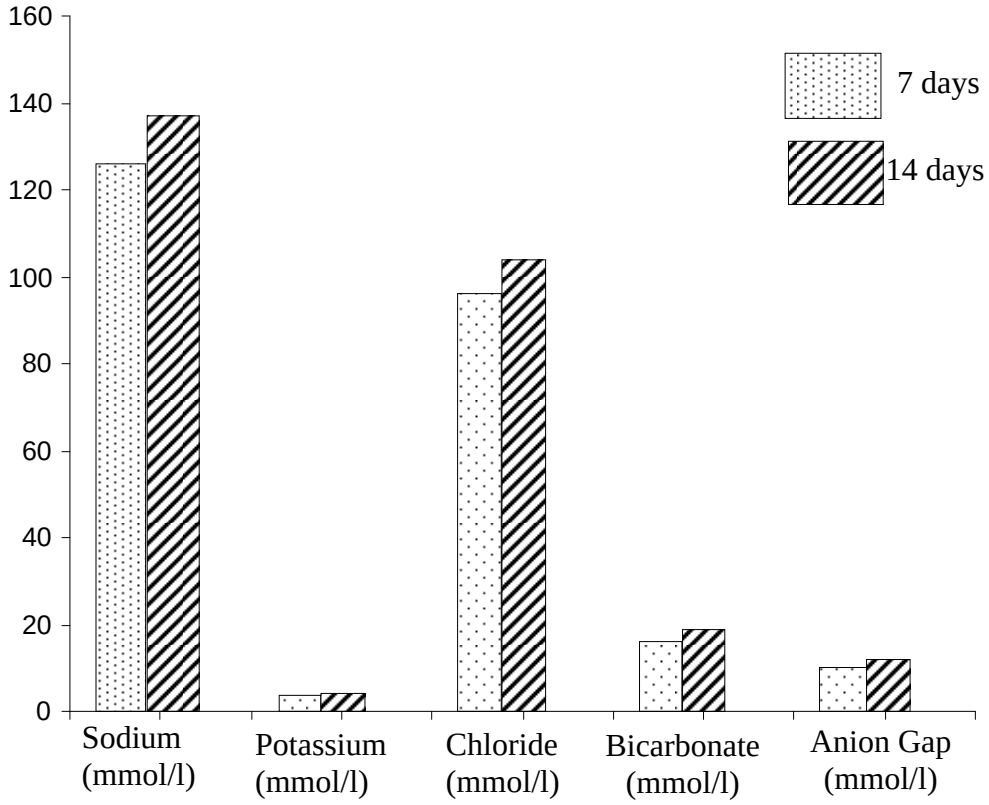

Figure 1: Electrolyte concentrations on the 7th day and 14th day of consumption of *Jatropha tanjorensis* aqueous extract.

DISCUSSION

The result of this study showed that the consumption of *Jatropha tanjorensis* extract by apparently healthy individuals for 14 days, caused significant increase in the blood concentration of electrolytes such as sodium, potassium and chloride when compared to concentrations before consumption. This is similar to the work of some researchers[8] who worked on the effect of *Jatropha tanjorensis* on electrolyte in Albino wistar rats.They attributed the increase in potassium concentration in the blood of the ra tto have resulted from high potassium content in the extract of *Jatropha tanjorensis* [9] .The high percentage of potassium in the extract administered to the individuals increased the plasma concentration of potassium and this stimulates the release of aldosterone by the adrenal cortex. Aldosterone acts mainly on the principal cells of the renal tubule to cause an increase in the reabsorption of sodium. This process is actively carried out by the kidneys. All these processes may also be responsible for the increase in the bicarbonate concentration. High levels of potassium leads to inappropriate cellular metabolism (acidemia), insulin deficiency and decreased renal excretion[10] as a result of potassium redistribution.

Table 1 showed that anionic gap in this study after 14 days of consumption was significantly increased. This indicated that *Jatropha tanjorensis* may affect metabolic acidosis and electrical charge of the body.

Chloride concentration in the study significantly increased. This may be attributed to the fact that *Jatropha tanjorensis* helped to maintain normal balance of fluid in the body. Chloride plays a role in helping the body maintain a normal *balance* of fluid. Chloride gives a differential diagnosis of acid-base disturbances and acid-base homeostasis. High Chloride can be caused by increased production or diminished excretion of organic acids[11].

Bicarbonate concentrations of individuals administered with *Jatropha tanjorensis* leaves was within the range. Bicarbonate ion acts as a buffer to maintain the normal level of acidity (pH) in the blood and other fluids of the body system. Bicarbonate level is measured to monitor the acidity of the body fluid. The significant change in bicarbonate may be attributed to the presence of antioxidant in *Jatropha tanjorensis* which contributes to anti-inflammatory functions and stimulate digestive enzyme [12].

This study in Table 1-3 showed that Sodium was significantly increased after after consumption of *Jatropha tanjorensis*, Sodium is a major cation of extracellular fluid that takes care of osmotic strength of plasma, functions in distribution of water and aids the extra osmotic pressure in the extra cellular fluid compartment of the body [13].

This study also showed that electrolytes (sodium, potassium, chloride, and bicarbonate and anion gap) are significantly affected by the consumption of *Jatropha tanjorensis* leaves. *Jatropha tanjorensi s*has been known to have antimicrobial, antioxidant, anti-inflammatory properties [12]. However, the significant differences in serum electrolyte in healthy human administered with *Jatropha tanjorensis* leaves extract may indicate that osmotic gradient are affected by *Jatropha tanjorensis* leaves extract. Electrolytes leave

and enter the cell membrane through ion channel and are important for muscle concentration. The significant difference in sodium, potassium, chloride and anion gap may be attributed to the presence of mineral element present in *Jatropha tanjorensis* leaves which helps in maintenance of electrolyte balance in human.

The general increase in the levels of the electrolytes in the blood of the consumers resulted probably from such factors as over production [14], injury to organs or tissues which may have caused leakage [15] or the inability of the blood to redistribute the electrolytes to sites of action [16].

Fluctuations in ions concentrations meddles with the communication of electrical signs across the cells thus resulting in cell failure, impair the co-ordination of cell instincts and relay of messages [15].Furthermore, this situation particularly enhances the probability of experiencing unbalanced heartbeats (arrhythmias). Increase in sodium and potassium ion within the 7^{th} and 14^{th} day period can be ascribed to kidney injury or dysfunction, since kidney is the usual pathway for ions [17] or from effect of overdose of the plant extract on vital human organs or tissues [18].

CONCLUSION

Conclusively, this study showed that electrolyte concentrations are affected by *Jatropha tanjoresis* consumption, as the aqueous extract significantly reduced sodium, potassium, chloride and bicarbonate concentrations on the 7^{th} day after consumption while causing an increase on the 14^{th} day of consumption.

RECOMMENDATION

It is recommend that *Jatropha tanjorensis* consumption which is use for the treatment of diabetes mellitus, fever and treatment of veneral diseases should be used with caution as it could lead to derangement in electrolyte concentrations in the body. Further study on its effect on body organs such as kidney is recommended.

ETHICAL APPROVAL

Well written approval was obtained and kept by the Authors (CHST/RJC/001/18)

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