The Effect of *Jatropha tanjorensis* on Blood Electrolyte Concentrations of Albino Wistar Rats

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ABSTRACT

The aim of this research work is to determine the effect of *Jatropha tanjorensis* on blood electrolyte concentration. Forty rats were used for this work, the rats were divided into two groups; the control and the treated group, and each group consists of twenty rats with ten males and ten females. 0.5 g/kg body weight of the extract of *Jatropha tanjorensis* was administered to the rats in the extract group for a period of twenty eight (28) days. The rats were sacrificed after 28 days and blood samples were collected into a clean lithium heparinised tube and the blood sample were analyzed for sodium, Potassium, chloride, bicarbonate, creatinine and urea concentrations. There were statistically significant increases ($p< 0.001$) in the mean concentrations of sodium, potassium and Chloride in both the male and female wistar rats. There were no significant differences in the creatinine, urea and bicarbonate of both the male and female rats when compared with control group. Therefore *Jatropha tanjorensis* causes significant increases in sodium, potassium and chloride concentration in the blood.

KEY WORDS: Na^+ concentration, K^+ concentration, Wistar rats, *Jatropha tanjorensis*

INTRODUCTION

Plants are used in the modern era for the extraction and development of many drugs which enhance the traditional use of herbal remedies (UNESCO, 1998). *Jatropha tanjorensis* is an herbaceous plant of euphorbiaceae family and commonly called hospital too far (Iwalewa *et al.,* 2005). The leaf of *Jatropha tanjorensis* has been used as a vegetable and for the treatment of diabetics in Nigeria (Olayiwole et al., 2004). Previous researchers indicated their pharmacological values and toxicological effects while some others claimed that this plant is toxic to the organs of human body (Ehimwenma and Osagie, 2007). The leaf extract has been used as an anticoagulant for biochemical and haematological analyses (Oduola et al., 2005). Phytochemical screening of *Jatropha tanjorensis* leaf revealed that it contains bioactive principles such as alkaloids flavonoids tannins, cardiac glycosides, antraquinones and saponias (Ehimwema and Osagie, 2007).

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It was reported that administration of *Jatropha tanjorensis* leaf powder to rabbits resulted in the improvement of their haematological indices which revealed an enhancement of bone marrow function (Orhue et al., 2008). The aim of this study was to assess the effect of *Jatropha tanjorensis* on sodium, potassium, urea, creatinine, bicarbonate and chloride ion concentrations in plasma.

METHODOLOGY

Preparation of plant extract

Jatropha tanjorensis leaves were collected and the leaves were air dried for 2 days, and then oven dried at 40^0c for 30 minutes. The leaves were ground into powder using a milling machine. The powder sample was then weighed. The powder sample was then soaked in a chromatographic tank with about 1.5ml of distilled water for 24hrs; it was then filtered with a Whitman filter paper (125mm) in order to differentiate the residue and the filtrate. The filtrate was concentrated in a water bath and evaporating dish to paste level.

Experimental animals

A total of 40 rats were used for this work. Male albino wistar rats weighing between 150-205g and female albino wistar rats weighing between 145-200g were used for the study. The animals were obtained from the animal house, department of Anatomy, University of Benin and were kept in a well ventilated and hygienic animal house under constant environmental and nutritional conditions. And the rats were kept in metabolic cages and given food and water *ad libitum*.

Animals were divided into 2 main groups; control and treated group of 20 rats each. Each group consists of 10 male and 10 female rats. The rats in the treated group were administered 0.5g/kg body weight of the extract for a period of 28 days. The rats in the control were not given anything else aside for food and water.

The rats were sacrificed after 28 days and blood samples were collected into a clean lithium heparinized test tube and the blood sample was taken to the laboratory for the analysis of sodium, Potassium, chloride, bicarbonate, creatinine and urea concentrations.

STATISTICAL ANALYSIS

Results are presented in mean ± standard error of the mean. Statistical analysis was performed by the Statistical Package for the Social Science (SPSS), Chicago IL USA (2007) Excel Statistical Package. $P<0.05$ indicated statistical significance.

RESULTS

Table 1: shows the mean ±standard error of the mean of the concentration of some blood electrolytes for the control and treated groups. The result from the experiment showing the comparison of the mean Na^+ of the control (136 ± 0.5 mmol/L) and the treated (138.5 ± 0.4 mmol/L) in the male rats showed a significant increase. The comparison of the mean Na^+ concentration of the control (135.8 ± 0.5 mmol/L) and the treated (138.9 ± 0.4 mmol/L) in the female rats showed a significant increase ($p<0.001$) in Na^+ concentration.

The comparison of the mean K^+ concentrations of the control (4.2 ± 0.1 mmol/L) and the treated (4.7 ± 0.1 mmol/L) in the male rats showed a significant increase of ($p<0.001$).

Table 1: Concentration of some blood electrolytes for the control and treated groups.

	MALES		FEMALES	
BLOOD ELECROLYTE	**CONTROL GROUP**	**TREATED GROUP**	**CONTROL GROUP**	**TREATED GROUP**
Na^+ (mmol/L)	136.0±0.5	138.5±0.4***	135.8±0.5	138.9±0.4***
K^+ (mmol/L)	4.2±0.1	4.7±0.1***	4.1±0.1	4.7±0.1***
HCO_3 (mmol/L)	20.9±0.3	22.0±0.4	21.4±0.6	22.9±0.3
Cl (mmol/L)	101.4±0.5	103.8±0.4*	102.1±0.7	104.2±0.4*
Creatinine (mg/dl)	0.77±0.02	0.81±0.02	0.79±0.03	0.81±0.03
Urea conc.(mg/dl)	30.6±0.8	32.2±0.7	30.0±1.1	31.1±1.0

*Represents significant difference. * = $p<0.05$, ***= $p<0.001$

The comparison of the mean K+ concentrations of the control (4.1 ± 0.1 mmol/L) and the treated (4.7 ± 0.1 mmol/L) in the female rats showed a statistically significant increase ($p<0.001$). The comparison of the mean Cl- concentrations of the control (101.4 ± 0.5 mmol/L) and the treated (103.8 ± 0.4 mmol/L) in the male rats showed a statistically significant increase ($p<0.05$). There were no statically significant differences in the creatinine of both the male and female rats in the treated group when compared with the control group. The same was observed for Bicarbonate concentration, and urea concentration, although there were visible increases in their values.

DISCUSSION

Jatropha tanjorensis has been shown by Arun *et al*., (2012) to contain a higher percentage of potassium ions compared to sodium (K^+-2.15% and Na^+-0.56%). The high percentage of potassium in the extract administered to the treated group increases the plasma concentration of potassium and this stimulates the release of aldosterone by the adrenal cortex (Linas and Berl, 1989). Aldosterone acts mainly on the principal cells of the renal tubule to cause an increase in the reabsorption of sodium in exchange for potassium (Wiederholt *et al*., 1972). This will result in an increase in the plasma sodium concentration, as the kidneys excrete potassium. Sodium reabsorption creates the driving force for the reabsorption of chloride ions (Constanzo, 2007). The reasbsorption of sodium and chloride ions as a result of the high potassium concentration in plasma is suggested to be the cause of the observed increase in sodium and chloride in the treated group while the high percentage of potassium ions in the extracts directly increases the plasma potassium concentration in the treated group.

For proper maintenance of acid-base balance by the kidneys, bicarbonate ions filtered by the glomerulus must be constantly reabsorbed by the renal tubular cells in order to maintain the plasma bicarbonate pool (Constanzo, 2007). This may be responsible for the little increase in the bicarbonate concentration of the treated group as bicarbonate concentration is closely regulated by the kidneys. Urea and creatinine are non electrolytes found in the body. Urea is produced from metabolism of amino acid and creatinine is formed from the metabolism of muscle creatinine and creatine phosphate. They are both excreted by the kidneys (Guyton and Hall, 2006). The excretion of urea and

creatinine is used to ascertain renal function. This process is actively carried out by the kidneys. All these process may also be responsible for the little increases in the urea and creatinine concentration although not significant as they are excreted by the kidneys. Finally the effect of *Jatropha tanjorensis* extract on the electrolyte constituents assessed by this study is consistent in both the male and female rats and this indicate that the sex of the experimental animal does not significantly alter the effects of the extract.

CONCLUSION

From the study, the administration of 0.5g/kg body weight of *Jatropha tanjorensis* extract to the rats for 28 days, caused an increase in the blood concentration of electrolytes like sodium, potassium and chloride due to the high concentration of potassium in the extract, and no significant changes in the concentration of urea, creatinine and bicarbonate as the kidneys was able to carry out its normal metabolic functions on these electrolytes.

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