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Effect of *Cocos nucifera* Water on Liver Enzymes

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Abstract: The effect of *Cocos nucifera* water on liver enzymes was investigated in albino rats using spectrophotometric methods. Sixteen albino rats were divided into four groups (A, B, C and D) of four rats each. The animals in groups A, B, C and \ D were administered the *Cocos nucifera* water through oral intubation at the doses of 0, 10, 20 and 30(ml/kg) for fourteen days. Blood samples were collected on the fifteenth day following the last day of administration. The alanine aminotransferase activities (u/l) recorded 52.00 ± 3.00, 43.50 ± 2.50, 36.50 ± 2.80 and 31.50 ± 2.20 for the animals in groups A, B, C and D respectively, with corresponding activities (u/l) of aspartate aminotransferase as 36.00 ± 2.77, 27.00 ± 2.61, 21.50 ± 1.80 and 18.00 ± 1.77. The alkaline phosphatase activities (u/l) also recorded 161.70 ± 3.77, 143.50 ± 3.71, 133.60 ± 2.70 and 102.30 ± 2.60 for the animals in groups A, B, C and D respectively. There were dose-dependent significant (p<0.05) reductions in the activities of liver enzymes of the animals that received *Cocos nucifera* water, hence it could be hepato-protective.

Key words: *Cocus nucifera* Water · Liver Enzymes · Albino Rats

INTRODUCTION

The *Cocos nucifera* otherwise called coconut is an important fruit tree in the tropical regions and the fruit can be made into a variety of foods and beverages. The edible part of the coconut fruit is the endosperm tissue. Endosperm tissues undergo one of three main modes of development which are the nuclear, cellular and helobial modes and the development of coconut endosperm belongs to the nuclear mode [1].

Unlike the endosperms of other plants (e.g., wheat and corn), the cellularization process in a coconut fruit does not fill up the entire embryo sac cavity, but instead leaves the cavity solution-filled. This solution is commonly known as coconut water and it is of cytoplasmic origin [2].

Nutrients from coconut water are obtained from the seed apoplasm and are transported symplasmically (through plasmodesmata) into the endosperm. Coconut water contains sugars, vitamins, minerals, proteins, free amino acids and growth promoting factors [3].

Coconut water should not be confused with coconut milk, although some studies have used the two terms interchangeably. The aqueous part of the coconut endosperm is termed coconut water, whereas coconut milk, also known as "santan" in Malaysia and Indonesia and "gata" in the Philippines, refers to the liquid products obtained by grating the solid endosperm with or without addition of water. Coconut water is served directly as a beverage to quench thirst, while coconut milk is usually used as a food ingredient in various traditional cooking recipes. The main components of coconut milk are water, fat and protein, whereas coconut water contains mainly water [4].

Conversely, coconut water has been extensively studied since its introduction to the scientific community in the 1940s. In its natural form, it is a refreshing and nutritious beverage which is widely consumed due to its beneficial properties to health, some of which are based on cultural/traditional beliefs. It is also believed that coconut water could be used as an important alternative for oral rehydration and even so for intravenous hydration of patients in remote regions [5].

Several studies have highlighted the effects of dietary coconut oils on humans and experimental animals. Little, however, exists in the literature regarding the effects of ingested coconut water on plasma enzymes.

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Presently only few feeding studies have examined the relationship between coconut water and the amounts of serum enzymes (such as alkaline phosphatase, alanine and aspartate transaminases) to detect apparent abnormalities in liver [6]. Coconut water is naturally sterile, does not produce heat, does not destroy red blood cells and is readily accepted by the human body because of its resemblance to human plasma, it can be injected intravenously in emergency cases to help carry nutrients and oxygen to cells and prevent dehydration [7].

In toxicity studies, the majority of the enzymes measured as indices of metabolism are released into the bloodstream when cells are damaged or their functions are disrupted. Cell membrane integrity as assessed by its ability to prevent enzyme leakage is dependent on intracellular energy. The cell membranes are therefore impermeable to enzymes as long as the cells are metabolizing normally [8].

Thus it was necessary to evaluate the effect of coconut water on some enzymes used as markers of organ function; hence this work was aimed at investigating the effect of *Cocos nucifera* water on the liver enzymes of albino rats.

MATERIALS AND METHODS

The albino rats were obtained from the University of Nigeria, Nsukka while *Cocos nucifera* fruits were obtained from Onicha in Ohaozara Local Government Area in Abakaliki, Ebonyi State. All chemicals and reagents were of analytical standard.

Administration of *Cocos nucifera* water: The rats were randomly divided into four groups (A, B, C and D) containing four rats in each group. Groups A (Control), B, C and D were administered the *Cocos nucifera* water twice daily through oral intubation at the doses of 0, 10, 20 and 30(ml/kg) respectively for fourteen days and the animals were fed with rat chow and water *ad libitum*.

Collection of blood samples: The blood samples were collected by ocular puncture with capillary tubes into labeled EDTA bottles.

Determination of enzyme activities: The aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) activities were determined by the methods of Reitman and Frankel [9].

Statistical Analysis: Results were expressed as the mean ± Standard deviation. The differences among means were analyzed by one-way ANOVA. A value of $P < 0.05$ was considered as statistically significant [10].

RESULTS AND DISCUSSION

The effects of *Cocos nucifera* water on aspartate aminotransferase (AST) activity showed that there was a dose-dependent significant ($p<0.05$) reduction (Fig. 1). The report of Maher [11] on exploring the effect of alcohol on liver function in rats and the reduction of hepatotoxicity explained the important role played by *Cocos nucifera* water in the significant ($p<0.05$) reduction of aspartate aminotransferase (AST) activity. The work of Dial [12] on clinical pathological evaluation of the liver recorded a significant ($p<0.05$) reduction in aspartate aminotransferase (AST) activity of the rats administered the extract of *Gmelina arborea* and this could be a reflection of the absence of degenerative changes in the muscles and livers of the rats receiving the treatments. Thabrew *et al.* [13] also emphazised on the effect of *Cocos nucifera* water on the reduction of aspartate aminotransferase (AST) activity and on the pancreatic β-cells of the liver.

The activity of alanine aminotransferase (ALT) recorded a dose-dependent significant ($p<0.05$) reduction following the administration of *Cocos nucifera* water (Fig. 2). The work of Palmer [14] on comparative study of efficacy of *Paetta indica* and *Osbeckia octandra* in the treatment of liver dysfunction recorded a significant ($p<0.05$) reduction in the activity of ALT. He reported that the reduction in the activity of ALT is an indication of stabilization of plasma membrane as well as repair of hepatic tissue damage. Baldi *et al.* [15] explained the role of alanine aminotransferase as a liver-specific enzyme and that elevation in the activity of ALT in the blood above normal value is a sign of inflammation and/or injury to the liver cells. The possible mechanism may be due to the direct protective action of natural antioxidants present in the *Cocos nucifera* water. Several studies reported that some micronutrients such as inorganic ions and vitamins play a vital role in aiding the human body's antioxidant system [16].

Alkaline phosphatase activity also recorded a dose-dependent significant ($p<0.05$) reduction (Fig. 3). The reduction in the activity of alkaline phosphatase (ALP) in the report of Baldi *et al.* [17] is associated with

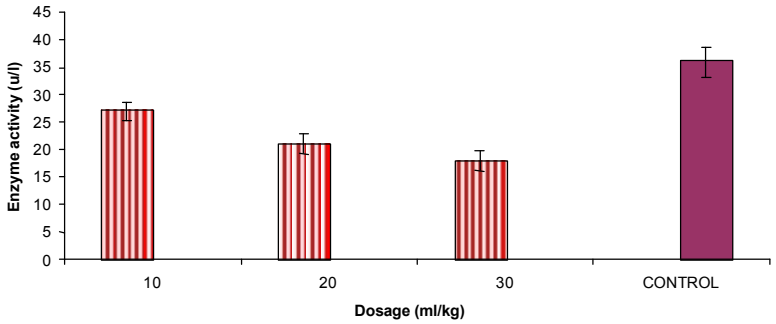

Fig. 1: Bar chart representation of the effect of *Cocos nucifera* water on aspartate aminotransferase (AST) activity in albino rats

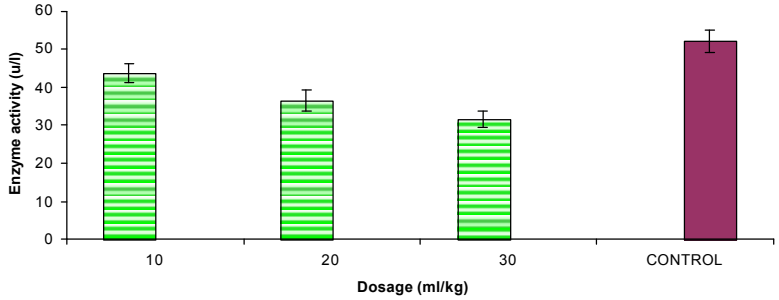

Fig. 2: Bar chart representation of the effect of *Cocos nucifera* water on alanineaminotransferase (ALT) activity in albino rats

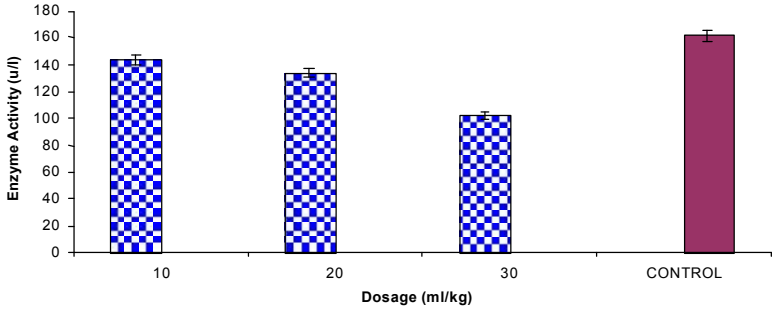

Fig. 3: Bar chart representation of the effect of *Cocos nucifera* water on alkaline phosphatase (ALP) activity in albino rats

magnesium as ALP activity is almost inhibited due to chelation of zinc and magnesium cofactors. The non-uniform trend in alkaline phosphate (ALP) values which recorded significant (p<0.05) differences among the groups reported by Noboru [18] on *Garcinia* kola extract was attributed to a number of factors including the homeostatic mechanisms of the animals and the active ingredients in the extracts of *Garcinia* kola being functionally relative to each other in respect of quantities available.

In conclusion, *Cocos nucifera* water induced dose-dependent significant (p<0.05) reductions in the activities of aspartate aminotransferase, alanine aminotransferase and alkaline phosphatase hence it could be hepatoprotective.

REFERENCES

1. Lopes, M.A. and B.A. Larkins, 1993. Endosperm origin, development and function. Plant Cell, 5: 1383-1399.
2. Janick, J. and R.E. Paull, 2008. The Encyclopedia of Fruit and Nuts. CAB International, Wallingford, UK., pp: 112.
3. Muanya, C., 2009. Researchers validate coconut water as nature's energy drink. Health Benefit, 320(5): 1-6.
4. Seow, C.C. and C.N. Gwee, 1997. Coconut milk: Chemistry and technology. International Journal of Food Science Technology, 32: 189-201.

5. Alleyne, T., S. Roache, C. Thomas and A. Shirley, 2005. The control of hypertension by use of coconut water and mauby: Two tropical food drinks. West Indian Medical Journal, 54: 3-8.
6. Pehowich, D.J., A.V. Gomes and J.A. Barnes, 2000. Fatty acid composition and health effects of coconut constituents. West Indian Journal, 49(2): 128-133.
7. Campbell, F.D., T. Thomas, T.M. Falck, N. Tutuo and K. Clem, 2000. The intravenoususe of Coconut water. American Journal of Emergency Medicine, 18: 108-111.
8. Numakami, K., Y. Aoki, Z. Ogawa and H. Itoh, 1999. A kinetic model of mitochondrialaspartate aminotransferase transmigration in hepatobiliary disorders. Analytical Clinical Biochem., 36: 226-232.
9. Reitman, S. and S. Frankel, 1957. A colorimetric method for the determination of serumglutamic oxaloacetic and glutamic pyruvic transaminases. American Journal of Clinical Pathology, 28: 56-60.
10. Hinkelmann, K. and O. Kempthorne, 2008. Principles of experimental design; the linear model; outline of a model. John Wiley and sons, New York., pp: 125-126.
11. Maher, J.J., 1997. Exploring alchohol effect on liver function. Alchohol Health and Research World, 21(1): 113-117.
12. Dial, S.M., 1995. Clinical pathological evaluation of the liver. The Veterinary Clinics of North America, 25: 257-293.
13. Thabrew, M.I., P.D. Joice and W.A. Rajatissa, 1987. Comparative study of efficacy of Paetta indica and Osbeckia octandra in the treatment of liver dysfunction. PlantaMedicine, 53: 239-241.
14. Palmer, M., 2004. Guide to Hepatitis and Liver disease. Penguin Patnam, 3: 1-5
15. Baldi, E., P. Burra, M. Plebani and M. Salvagnini, 1993. Serum malondialdehyde and mitochondrial aspartate aminotransferase activity as markers of chronic alcohol intake and alcoholic liver disease. Italian Journal of Gastroenterology, 25: 429-432.
16. Shenkin, A., 2006. The key role of micronutrients. Clinical Nutrition, 25: 1-13.
17. Baldi, E., P. Burra, M. Plebani and M. Salvagnini, 1993. Serum malondialdehyde and mitochondrial aspartate aminotransferase activity as markers of chronic alcohol intake and alcoholic liver disease. Italian Journal of Gastroenterology, 25: 429-432.
18. Noboru, H., 2001. Garcinia kola extract inhibits lipid droplet accumulation without affecting adipose tissue conversion in 3T3-L1 cells. Phytotherapy Research, 15: 172-173.