

Evaluation of the Effects of *Phoenix dactylifera*. L Fruits Consumption on Serum Biochemical Parameters in Albino Rats.

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Abstract

This study investigated the effects of *Phoenix dactylifera* fruit consumption on some biochemical parameters in albino rats. Twenty-four (24) rats were randomly divided into four groups of six rats each. The control group were fed rodent diet alone while other groups received 10%, 20% and 40% *Phoenix dactylifera* for 42 days. The animals' body weight, food and water consumption were observed. At the end of the experiment, blood samples collected and assayed for renal and liver functions. *Phoenix dactylifera* enhanced renal functions and lowered the levels of alanine and aspartate aminotransferase compared to the control group. Consuming this fruit may serve protective functions for the liver and kidney.

Keywords: *Phoenix dactylifera*; serum enzymes; renal and liver functions

Introduction

Date palm fruits (*Phoenix dactylifera*) have served as a staple food for millions of people around the world for many centuries without adequate knowledge of the health benefits associated with it (Vayalil, 2012). The fruit is sometimes incorporated into the traditional and herbal medicine used in the treatment of some common diseases (Khaliq et al., 2015). In medicinal practice in Northern Nigeria, the date palm fruit is consumed as a form of treatment against health concerns such as male infertility (taken as a tonic and aphrodisiac), hypertension and diabetes. This fruit has also been used as cleansers and astringents in abdominal troubles, treatment of sore throats, cold, bronchial asthma and to counteract alcohol intoxication (Alkofahi et al., 2017; Selmani et al., 2017; Shams-Ardekani, et al., 2010). Dates have been known to play preventive roles in the aetiology of some diseases through antioxidant, anti-inflammatory and antibacterial activities (Habib et al., 2013; Al-Alawi, et al., 2017). Dates have been scientifically confirmed to produce a variety of pharmacological activities which indicates its usefulness against different diseases and disorders (Mansouri et al., 2005; Habib and Ibrahim 2011; Rahmani et al., 2014; Al-Alawi et al., 2017). In view of the widespread consumption of *Phoenix dactylifera* fruit in Northern Nigeria and

scarcity of information on the effects of its long-term consumption on the kidney and liver, this work investigated the biochemical effects of different levels of consumption of the date palm fruit on some liver and kidney parameters.

Materials and methods

Collection and preparation of plants

materials

The date palm (*Phoenix dactylifera* Linn) fruits were purchased from a local market in Maiduguri, Borno State. It was identified by a plant taxonomist, Prof. S.S Sanusi, Department of Biological Sciences, University of Maiduguri. The date palm fruits were sun dried and the seeds were separated from the fruits. The dried fruits were milled into fine powder using a commercial miller and stored in airtight plastic containers and later used for diet supplementation.

Experimental animals

Twenty four (4) Male albino rats (Wistar strains) used in this study were obtained from the Department of Animal production, University of Maiduguri and were housed in standard cages and kept under 12 h–light/dark cycles at room temperature (29±3°C) in the animal house of the Department of Biochemistry, Faculty of Science

University of Maiduguri, Nigeria. The animals were fed with food and water *ad-libitum*. Environmental conditions of animals and experimental procedures were in accordance with the approved guide for care and use of laboratory animals (National Institutes of Health, 1985).

Experimental design

Different percentages of milled *Phoenix dactylifera* L. fruits were incorporated into the rodent diet, pelleted, oven dried and fed to the animals. The animals (six (6) per group) were fed the diets according to the treatment below for 42 days.

Group I. served as controls and received only the rodent feeds

Group II. 10% (w/w) *Phoenix dactylifera* and rodent feeds

Group III. 20% (w/w) *Phoenix dactylifera* and rodent feeds

Group VI. 40% (w/w) *Phoenix dactylifera* and rodent feeds

At the end of the experiment, all animals were fasted overnight and weighed before they were sacrificed.

Biochemical analysis

Blood samples were collected by cardiac puncture into plain containers and were centrifuged at 3000 rpm for 15 min in a hetich EBA 35 centrifuge, clear sera samples obtained were used for biochemical analysis. Samples collected were assayed for activities of Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST) and Alkaline Phosphatase (ALP) using Randox diagnostic kits. The levels of sodium, potassium, urea and creatinine in the sera were also determined using Randox diagnostic kits.

Statistical analysis

The results were expressed as Mean \pm standard error of mean (SEM) of 6 replicate determinations and the differences between the mean values were subjected to one way analysis of variance (ANOVA) followed by Tukey multiple comparison tests. *p* values < 0.05 were considered significant. Statistical analyses were carried out using GraphPad prism version 5.01.

Results and Discussion

Phoenix dactylifera has long been considered an important food consumed either as fruit or syrup without satisfactory information about its nutritional

value and health benefits (Vayalil 2012; Rahmani et al., 2014). The fruits have been recognised as a rich source of antioxidant compounds mainly phenolics (Habib and Ibrahim 2011; Habib et al., 2013). This study investigated the effects of the consumption of date palm fruits at different levels (10, 20, and 40%) and the beneficial effects or otherwise on some liver and kidney parameters in the serum. Observations from the experimental animals showed no difference in the food consumption and water intake of both the control and treated groups nor were there observable symptoms in any of the groups fed with the *Phoenix dactylifera* fruits during the experiment. The body weights of each group varied in the levels of increase at the end of the experiment but were not significantly different ($p > 0.05$) from the control group (**Table 1**).

Biochemical parameters analysed in the sera were used to evaluate the change in the concentration of enzymes and electrolytes as a result of the incorporation of *Phoenix dactylifera* fruit into the diet. AST and ALT are considered important tests in evaluating liver function. However, ALT is more specific to the liver compared to AST. The effects of date palm consumption on these enzyme biomarkers are shown in **Table 2**. A significant ($p < 0.05$) reduction in the serum ALT and AST level were observed in the groups fed 20 and 40% of *Phoenix dactylifera* after 42 days of experiment as compared to control group but no substantial difference exist between control group and rats fed 10% of *Phoenix dactylifera*. The decrease in ALT and AST shows the efficacy of date palm as a dynamic liver support. This result, agrees with the findings of Habib et al. (2013) who reported date seeds to possess functional ingredient for human food. Habib and Ibrahim, (2011) also showed that date seeds exerted antioxidant activity in rats fed diets containing 7% and 14% date seed powder for 30 days. Their studies also observed no adverse effects on organ function, lipid profile, protein metabolism, haematological parameters, and body weight. For the serum ALP, a significantly increased level was observed in rats fed with 40% *Phoenix dactylifera* compared to the control group, this increase may not be directly related to liver function as any condition that affects bone growth, increased body weight/obesity or causes increased activity of bone cells can affect ALP levels in the blood (Khan et al., 2015).

Table 1: Initial average weight, final average weight and percentage weight increase of rats fed with *Phoenix dactylifera*

Treatment	Control	10%	20%	40%
Initial weight (g)	152.72±15.23	139.90±15.39	126.50±11.87	135.50±16.54
Final weight (g)	183.00±7.21	166.11± 13.54	162.23±12.10	177.31±20.34
Weight increase (%)	19.83 ± 3.94	18.73 ± 8.15	28.36±7.46	30.86±8.60

Values are Mean ± SEM, n=6. No significant changes were observed in the percentage change in weight compared to the control group (p>0.05)

Table 2: Effects of *Phoenix dactylifera* on some enzyme markers of liver function

Groups	AST(U/L)	ALT(U/L)	ALP(U/L)
Control	114.00±1.79	30.60 ± 1.21	78.00±1.96
10%	105.80±1.11	30.30 ± 1.03	80.00±1.90
20%	103.20±1.67	26.00 ± 0.07	81.01±1.14
40%	103.00±1.36	23.00 ± 0.08	97.20±1.16*

Values are Mean ± SEM, * significantly (p<0.05) increased compared to control group

Serum urea and creatinine are among the important metabolites by which renal function can be assessed. Increased levels of these metabolites in serum are associated with renal damage (Vayalil 2012). Consumption of *Phoenix dactylifera* did not considerably alter the serum creatinine levels in all the experimental groups. Likewise, the concentration of serum sodium did not show any substantial change in all experimental groups fed with *Phoenix dactylifera* fruits when compared to

the control group. This study also revealed a significant increase in potassium level in groups fed 20 and 40% (**Table 3**). Consumption of *Phoenix dactylifera* fruits can enhance kidney function and help correct electrolyte imbalance as the group fed with 20 and 40% *Phoenix dactylifera* fruits significantly increased the potassium concentration, which indicates its potential to overcome potassium imbalance.

Table 3: Effects of *Phoenix dactylifera* fruit on some Renal function parameters

Groups	Na ⁺ (mmol/l)	K ⁺ (mmol/l)	Urea (mmol/l)	Creatinine (µmol/l)
Control	138.60±0.81	6.68±0.15	6.22±0.17	133.60 ± 1.57
10%	138.00±0.71	6.16±0.15	6.50±0.28	134.00 ± 1.89
20%	139.20±0.96	9.90±0.36*	6.18±0.52	134.40 ± 1.03
40%	142.40±1.08	9.86±0.21*	5.90±0.51	137.00 ± 0.71

Values are Mean ± SEM, * significantly (p<0.05) increased compared to Control group.

The results obtained also indicate that *Phoenix dactylifera* fruits could serve as a good source for dietary potassium. Serum potassium and sodium represents the internal environment of the body and plays an important role in the regulation of blood pressure (Xi et al., 2015). The relationship between potassium, sodium and hypertension is well established.

Conclusion

The present work investigated the potential biochemical effects associated with consumption of date palm fruits for extended periods. From the findings of this study, the reduction of the ALT and AST activities and its effects on serum potassium and sodium, the fruits of this plant could serve as a good choice for improving renal and liver functions. Increased potassium levels in the serum validates its relevance in the management of hypertension.

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