ANTIOXIDANT ACTIVITY OF *CARICA PAPAYA* JUICE IN DIABETIC RATS

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ABSTRACT

Diabetes the Killer disease known worldwide has been implicated to generate oxidative stress and Carica papaya has been suggested to manage this effect. This study was therefore aimed at evaluating the antioxidant activity of C. papaya juice in diabetic rats with a view of proposing a management scheme. Adult male Wister rats (n = 8) were divided into three groups: Two experimental groups; group 1(diabetic treated with C. papaya juice), group 2 (diabetic untreated) and control (group 3). Animals were sacrificed 14 days after treatment with C. papaya juice. The blood glucose, total protein, total cholesterol, vitamin C and MDA concentrations were estimated. The results showed that the blood glucose concentration significantly increased (p<0.05) in group 1 (diabetic treated with C. papaya juice) compared to group 2 and 3. The total protein, total cholesterol and vitamin C concentrations were highest in the control group compared to the experimental groups (1 and 2). Group 1 showed significant increase (p<0.05) in the total protein, total cholesterol and vitamin C concentrations compared to group 2 (diabetic untreated). Group 1 (diabetic and treated with C. papaya juice had the highest MDA concentration compared to groups 2 and 3). The present study suggests that C. papaya juice has antioxidant activity that could be beneficial in the management of diabetes. However, C. papaya intake must be rationed since its consumption increases blood glucose concentration and invariably lipid peroxidation.

Keywords: Antioxidant, *Carica papaya*, Diabetes, Lipid peroxidation, Oxidative stress

INTRODUCTION

Diabetes has become one of the devastating disease state afflicting the health of many people in recent times and has been accounted for a high proportion of health problems worldwide (Morhan *et al.,* 2006). Diabetes mellitus is described as the common metabolic disorder of carbohydrate and fat metabolism which is due to absolute or relative lack of insulin and is characterized by hyperglycemia (Ogbonnia *et al.,* 2008). There is considerable evidence that hyperglycemic makes an important contribution in the development of diabetes complication (Morhan *et al.,* 2006). The development of free radicals directing to oxidative stress is as well as a result of deficient metabolic control in diabetes, coming from hyperglycemia (Mohanty *et al.,* 2000). Antioxidants are substances that inhibit the destructive effects of oxidation and prevent free radicals from forming (Droge, 2002), so will help to reduce diabetic complications. In Nigeria, pawpaw fruit is one of the most nutritional and cheapest fruit grown and consumed. Pawpaw has been attributed to the following properties antioxidant activity, immunomodulatory, hypoglycemia and hypolipidemic (Singh *et al.,* 2010).

Since no cure has yet been found, it is of utmost importance that (management measures be adopted for the management of

diabetes. This work therefore evaluated the antioxidant activity of *Carica papaya* juice in diabetic albino rats with a view of proposing a management scheme.

MATERIALS AND METHODS

Preparation of Plant Material: Fresh ripe pawpaw fruits were bought daily from the Ogige market, in Nsukka, Enugu State Nigeria, pilled, washed and blended into juice using an electronic blending machine. The juice was then collected and used in feeding the rats.

Procurement and Management of Animals: 24 adult male Wistar rats (150 – 220g) were purchased from the animal unit of the Department of Physiology, Faculty of Veterinary Medicine, University of Nigeria, Nsukka and housed in the animal house of the Department of Biochemistry, University of Nigeria, Nsukka, Nigeria. They were feed *ad libitum* with 25% crude protein commercial chicks mash diet (Top Feed, Nigerian Limited). The rats were given unlimited supply of clean water. After acclimatization, the rats were divided into 3 groups of 8 rats. Group 1 was diabetic and fed with *Carica papaya* juice; group 2 was diabetic untreated while group 3 was the control (non-diabetic). Animals were fed for l4 days and sacrificed on day 15.

Induction of Diabetes: Rats were fasted for 12-hours before diabetes was induced using alloxan. Groups 1 and 2 received a single intraperitioneal injection of 150 mg/kg of alloxan (Sigma, St Louis, Mo USA). Dissolved in normal saline (0.9%) and used within few minutes of its preparation. The diabetic state was confirmed on the 3rd day by blood glucose determination (Etuk and Muhammed, 2010).

Blood Sample Collection: Blood samples were collected by inserting a micro-capillary tube into the medical cantus of rats to punitive the retro-bulbar plexas and this enable the outflow of blood into an anticoagulant free tube. Blood from the capillary tube was dropped on the one-Touch glucometer (Lifescan, USA) and the blood glucose concentration was read directly from the machine.

Determination of Biochemical Parameters: The lipid peroxidation product (MDA) was determined using method of Moore and Robert (1998), vitamin C concentration was determined using the method described by Stanley and Venugopal (2001), while the total protein and total cholesterol concentrations were determined using Randox test kits.

RESULTS AND DISCUSSION

Both blood glucose and MDA concentrations were significantly increased ($p<0.05$) in group 1 compared to groups 2 and 3. The control group (group 3) had the highest concentrations of total protein, total cholesterol and vitamin C compared to the experimental groups (1 and 2). However, the concentration of total protein, total cholesterol and vitamin C were significantly increased ($p<0.05$) in group 1 treated with *C. papaya* juice compared to group 2 (diabetic untreated) (Table 1).

Carica papaya juice administration to diabetic rats significantly increased the blood glucose concentration compared to the other groups. Previous findings by Guevana and Panlasigui (2006) suggested the increase to be due to the high gylcemic index of *Carica papaya* (86). Rahmat *et al.* (2004) also observed an increase in blood glucose concentration after consumption of *Carica papaya*. The increase in blood glucose concentration in group 2 compared to group 3 may be due to the effect of alloxan which destroyed the insulin producing cells of the pancreas (Haffner *et al.,* 2000; Goldberg, 2001). The MDA concentration was observed to be high in group 1 compared to group 2 and 3. Suryawanshi *et al.* (2006) observed that the level of lipid peroxidation increases with increased blood glucose concentration. This probably explains the high MDA observed in this group. Group 3 (control) was shown to have the highest total protein and total cholesterol concentration compared to the experimental group. However the total protein and total cholesterol concentration of group 1 fed with *C. papaya* juice were significantly

Table 1: The blood glucose, total protein, total cholesterol, vitamin C and MDA, concentrations in the different groups of rats

Groups	Blood glucose (mg/dl)	Total protein (g/dl)	Total Cholesterol (mmol/l)	Vitamin C (mg/dl)	MDA (%)
Groups 1 (diabetic *Carica papaya* juice)	285.0± 72.1	6.38 ± 0.51	2.97 ±0.39	3.01 ± 0.39	99.11 ± 20
Groups 2 (diabetic untreated)	162 67± 11.23	4.68 ± 1.6	2.58 ± 0.56	2.48 ± 0.49	94.99 ±8.48
Group 3 (control, non-diabetic)	84.5±6.36	7.47 ±0.55	4.09±0.02	4.99 ±0.46	88.87 ±4.94

higher ($p<0.05$) compared to group 2 (diabetic untreated). Rahmat *et al.* (2004) had similar result and reported that *C. papaya* juice significantly increased the concentration of total protein and total cholesterol. Similarly, the control group had a higher vitamin C concentration compared to group 1 and 2 (experimental groups). However, group 1 (fed with *C. papaya*) had a higher vitamin C concentration compared to group 2 (diabetic and untreated). This result agreed with the findings of Abulaxnosa (2010) who attributed an increase in vitamin C concentration to *Carica papaya* consumption as a result of its antioxidant constituents.

Conclusion: The present study suggests that *C. papaya* has antioxidant activity that may be beneficial in the management of diabetes, but the consumption of *C. papaya* by diabetic patients should be regulated and closely monitored since its consumption increases blood glucose concentration.

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