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Original article

Glycaemic effects of date palm *(phoenix dactylifera)* in wistar rats

J.A. Tende [a,*], E.D. Eze [a], Y.A. Tende [b], A.R. Essien [a]

[a] *Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria.*
[b] *Department of Pharmacology and Clinical Pharmacy, Ahmadu Bello University, Zaria, Nigeria.*

[*] Corresponding author; Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria.

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ABSTRACT

Date palm fruit is commonly known fruit often called "Dabino" by Northern Nigerians. It is often eaten during fasting periods as it gradually improves low sugar levels due to its sugary or sweet nature. The present study aimed at evaluating the glycaemic responses of non diabetic albino rats administered with date palm *(phoenix dactylifera).* To accomplish this aim, animals were fasted for 18 hours after which they were randomly assigned into three (3) groups of five (5) animals each as follows: Group 1: Received 40g of glucose dissolved in 100ml of distilled orally, Group 2: Received 1000mg/kg b w of aqueous extract of date palm orally and Group 3: Received 1500mg/kg b w of aqueous extract of date palm orally. The results obtained indicated a non statistically significant (P>0.05) difference on blood glucose levels in the animals administered with the low and high doses of aqueous date fruit extract of 1000mg/kg b w and 1500mg/kg b w respectively when compared to the control group. However, oral administration of 1000 and 1500 mg/kg b w of date fruit extract produced a significantly decreased (p <0.05) blood glucose level when compared to the control group. In conclusion, the results from study revealed that date palm fruits may be classified as low glycaemic index food items, hence its consumption of may be of benefit in glycaemic control in non-diabetics.

1. Introduction

The glycaemic index (GI) is an important parameter of food quality which compares the hyperglycaemic effect of a tested meal with pure glucose (or of another defined standard food) (Chlup*et al.,* 2004). Glycaemic index indicates a food's potential effect on blood sugar levels. It is the ranking of foods based on the immediate effect they have on blood sugar levels. This index measures how much your blood glucose increases in two or three hours after eating (Mendosa, 2007). Glycaemic index helps to keep blood glucose levels under control. It is essentially necessary for people with diabetes, although athletes and overweight individuals also stand to benefit from knowing about this to enhance good nutrition. It measures how much of a rise in circulating blood sugar a carbohydrate triggers. The lower the number the lesser the effect it has (Buchhorn, 1997). Glycaemia can be divided into two: Hypoglycaemia and Hyperglycaemia. Hypoglycaemia is simply marked decrease in blood glucose level while Hyperglycaemia is a marked increase in blood glucose level. It is one of various characteristics of certain disease conditions, one of which is diabetes mellitus which is a common endocrine disorder. Diabetes mellitus is a metabolic disorder resulting from insulin defect in secretion, insulin action and possibly both. It is this insulin deficiency that progresses to chronic hyperglycemia (Bastki, 2005). Date fruit is scientifically referred to as *Phoenix dactyliferaL.* locally known as dabino in Hausa language in northern Nigeria. It is grown for its edible sweet nature and depending on the species; it has about 20-70 calories each. It can be eaten fresh or dried as snacks or in recipes such as cakes or stews. Date fruit is considered one of the oldest fruit trees cultivated. It is a medium-sized plant, 15–25 m tall, growing singly from a single root system. Fruit type is also dependent on the content of glucose, fructose and sucrose. Its phytochemical constituents include: alkaloids, flavanoids, steroids, tannins, estertepens, carbohydrates, vitamins and phenolic acids. However, some researchers say "date fruit increases blood sugar in hypoglycaemic subjects'' as date fruit improves blood glucose levels especially during fasting (Morton, 2006). The present study was designed to investigate the glycaemic effect of date palm *(phoenix dactylifera)* in wistar rats.

Fig.1. Date palm fruits *(Phoenix dactylifera).*

2. Materials and methods

2.1. Collection and preparation of date fruits plant

Fresh date fruits were purchased from a local market in Samara, Zaria, Kaduna State, Nigeria in the Month of August, 2012. The date fruits were then taken to the herbarium unit of the Department of Biological Science, Ahmadu Bello University, Zaria, Kaduna state, Nigeria, where the plant was identified by Mr. Gallah U.S. and a voucher specimen number (1180) deposited. Fresh date fruits were cleaned and air dried under shade and ground into fine powder. The powder (350g) was macerated in 2.0 L of distilled water with intermittent shaking using Flask shaker (SF1) at room temperature for 6 hours. It was then filtered using a filter paper (Whatmann size 1). The filtrate was evaporated to dryness using HH-S Digital thermostatic water bath maintained at 30°C for a period of 8hrs, after which a brownish residue weighing 222.75g was obtained and kept in a sealed container until it was reconstituted.

2.2. Animals

A total of fifteen (15) Albino wistar rats of both sexes weighing between 150-200g were obtained from the Department of Human Physiology, Animal House, Ahmadu Bello University, Zaria, Kaduna State, Nigeria. The animals were kept and maintained under laboratory condition of temperature, humidity and light. The animals allowed to acclimatize for two weeks and were allowed free access to water, before commencement of the experiments.

2.3. Experimental design

All animals were deprived of food for 18 hours and then randomly assigned into three (3) groups of five (5) animals each as follows:

Group 1: Received 40g of glucose dissolved in 100ml of distilled (40%) orally
Group 2: Received 1000mg/kg b w of aqueous extract of date palm orally
Group 3: Received 1500mg/kg b w of aqueous extract of date palm orally

2.4. Determination of Blood Glucose Levels

All blood samples were collected from the tail artery of the rats at intervals of 0 minute, 30 minutes, 60 minutes and 90 minutes using a Digital Glucometer (Accu-chek Advantage) and expressed in the unit of mg/dl. Blood glucose level was determined by the glucose-oxidase principle (Beach and Turner, 1958).

2.5. Statistical analysis

Data obtained were expressed as mean ± SEM. They were statistically analyzed using SPSS version 17.0 using ANOVA, followed by Tukey's post-hoc to compare the level of significance between the control and the experimental groups. The values of $p<0.05$ were considered as significant

3. Results

Table 1 shows the mean values of blood glucose level of non-diabetic rats administered with aqueous date fruit extract measured at time intervals of 0 minutes, 30 minutes, 60 minutes and 90 minutes. The base line for blood glucose in this present study is 70 mg/dl. The results obtained showed no statistically significant ($P>0.05$) difference on blood glucose levels in the animals administered with the low and high doses of aqueous date fruit extract of 1000mg/kg b w and 1500mg/kg b w after 0, 60 and 90 minutes respectively when compared to the control group.

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Table 1
Effect of aqueous Date fruit extract on mean (± SEM) blood glucose level in wistar rats

	Blood glucose levels			
Treatment groups	**0 minutes**	**30 minutes**	**60 minutes**	**90 minutes**
Glucose (40%)	75.00 ± 2.30	122.20 ± 26.82	91.40 ±12.32	87.00 ± 7.48
Date fruit 1000mg/kg bw	74.20 ± 2.82^{ns}	78.20 ± 8.66^{a}	94.80 ± 5.51^{ns}	90.20 ± 5.89^{ns}
Date fruit1500mg/kg bw	74.80 ± 6.24^{ns}	87.60 ± 5.33^{a}	83.80 ± 4.50^{ns}	82.60 ± 3.09^{ns}

$^{a}P<0.05$ is statistically significant when compared to the control group, while ns is not significant

4. Discussion

The concept of the glycaemic index of foods has been developed in the course of the last thirty years without having reached its final version (Sievpiper*et al.,* 2002). The glycaemic index (GI) is a useful nutrition concept, which is being used increasingly to classify the carbohydrate-rich foods based on their postprandial blood glucose response (Amanat*et al.,* 2009). Date palms are rich in certain nutrients and are widely consumed in many countries, particularly those within the Islamic world. The low GI of dates can be attributed to their high fructose and dietary fiber content. A diet low in GI may decrease the risk of coronary heart disease, gallbladder disease and

breast cancer. Furthermore, a low glycaemic index diet demonstrably improves HbA1c levels, body weight and the lipid profile (Alkaabi *et al.,* 2011). The results obtained showed no statistically significant difference (P>0.05) on blood glucose levels in the animals administered with the low and high doses of aqueous date fruit extract of 1000mg/kg b w and 1500mg/kg b w respectively when compared to the control group. However, oral administration of 1000 and 1500 mg/kg b w of date fruit extract produced a significantly decreased (p <0.05) blood glucose level when compared to the control group. The result from another study by Miller *et al.,* (2002) showed that dates can be classified as low glycaemic index food items and that the consumption of various varieties of date may be of benefit in glycaemic control.

5. Conclusion

In conclusion, the results obtained from this present study showed that Date palm fruits may be classified as low glycaemic index food items; hence its consumption may be of benefit in glycaemic control in non-diabetics.

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