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Short Communication

Phytochemicals and hypoglycaemic effect of methanol stem-bark extract of *Ficus sycomorus* Linn (Moraceae) on alloxan induced diabetic Wistar albino rats

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This paper reports the hypoglycaemic effect of methanol extract of stem-bark of *Ficus sycomorus* which was investigated in alloxan induced type-2 diabetic albino Wistar rats. The animals were separated into three groups and each was treated with 250, 500 and 1000 mg/kg (body weight) of the extract intraperitoneally. The methanol extract of stem-bark of *F. sycomorus* significantly reduced (P<0.05) the blood glucose levels in all the doses administered, but the effect was more prominent at the dose of 250 mg/kg. Preliminary phytochemical screening of methanol extract of the plant revealed the presence of flavonoids, glycosides, reducing sugars, tannins, resins and saponins. The results of this experimental animal study indicate that stem-bark of *F. sycomorus* possess some antidiabetic properties.

Key words: Phytochemicals, *Ficus sycomorus,* hypoglycaemic activity, alloxan, diabetic.

INTRODUCTION

Diabetes has been recognized as a clinical syndrome since ancient times and remains a crippling global health problem today. Diabetes mellitus is a group of heterogeneous, autoimmune, hormonal, metabolic, hyperlipidaemia and obesity disease. Current estimate suggests that approximately 150 million people worldwide suffer from diabetes mellitus (Muhammad and Ojewole, 2003). The number of diabetic patients is projected to reach more than 239 million by the year 2011. Regions with greatest occurrence are Asia and Africa, where diabetes rates could rise to two to three folds than present rates (American Diabetes Association, 1997).

Despite the great efforts that have been made in the understanding and management of diabetes, the disease and its related complications are increasingly unabated. Management of diabetes without any side effect is still a challenge to the medical system. This has led to an increasing demand for natural products with hypoglycaemic activity and fewer side effects (Kameswara et al., 1999). A number of plants have been reported to have antidiabetic action (Marles and Farnswort, 1995).

Ficus sycomorus Linn belongs to Moraceae, a family that is reputable for its medicinal values and consists of about 40 genera and over 1,400 species of trees, shrubs, vine and herbs, often with milky latex juices (Zerega et al., 2005). They are usually found near streams in the savannah area. *F. syocomorus* which is known as “Baure or Bore” in Hausa is a tree attaining height of 20 m with widely spreading branches and a massive crown. Sheep and cattle eat its foliage (Dalziel, 1953).

F. sycomorus have been suspected to possess antidiarrhoeal (Ahmadu et al., 2007) and anticonvulsant activities (Sandabe et al., 2003). The plant has also been reported to be a potent antimicrobial agent against ciprofloxacin resistant *Salmonella typhi* (Adeshina et al., 2010). The Hausa and Fulani tribes of northern Nigeria use the stem-bark of *F. sycomorus* to treat diabetes mellitus.

This study was carried out on alloxan-induced diabetic

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Table 1. Effect of methanol extract of *F. sycomorus* on blood glucose levels of alloxan-induced diabetic Wistar rats.

Treatment	Blood glucose level (mg/dl)				
	0 hour	2 h	4 h	8 h	24 h
F. sycomorus extract (250 mg/kg)	166.87 ± 24.87	187.52 ± 27.92[b]	183.87 ± 27.37[b]	78.35 ± 11.66[a]	76.02 ± 11.32[a]
F. sycomorus (500 mg/kg)	149.54 ± 22.28	172.66 ± 25.73[b]	157.53 ± 22.98[b]	160.28 ± 23.89[b]	151.54 ± 22.59[b]
F. sycomorus (1000mg/kg)	152.86 ± 22.78	168.35 ± 25.09[b]	160.88 ± 23.98[b]	160.43 ± 23.9[b]	163.62 ± 24.38[b]
Normal saline (control)	49.50 ± 7.37	49.59 ± 7.53	39.60 ± 5.90	53.64 ± 9.47	46.87 ± 4.00

Values are given as mean ± standard deviation of six rats in each group. Experimental groups are compared with diabetic control. [a]P<0.05 (significant); [b]not significant.

Wistar albino rats, to evaluate the hypoglycaemic effect of the methanol extract of stem-bark of *F. sycomorus.*

MATERIALS AND METHODS

24 Wistar albino rats (n = 6) of both sexes were purchased from the Department of Pharmacology, Ahmadu Bello University, Zaria, Kaduna State, Nigeria. The animals were weighed, housed and kept in standard cages and 12 h light/dark condition in the animals' house of the Department of Pharmacology, Bayero University, Kano. The animals were fed commercial feeds and were given water *ad libitum*. All the animals were fasted for 12 h but allowed free access to water, before commencement of the experiments.

Fresh stem-bark of *F. sycomorus* was collected from the outskirt of Mashi town in Mashi Local Government area of Katsina State, Nigeria. The plant material was collected in May, 2008. The plant was identified by Prof. B. S. Aliyu of the Biological Science Department, Bayero University, Kano, Nigeria, where the voucher number of the plant was submitted.

Extract preparation

The stem-bark of *F. sycomorous* was air-dried and pounded into fine powder. The powder (200 g) was percolated with 750 ml of methanol at room temperature for two weeks, then filtered. The percolate was concentrated using rotavapor machine at 40°C. The crude methanol extract obtained (8.82 g) was kept in a deep freezer until used.

Phytochemical screening

The methanol fraction (2.8 g) of the stem-bark of *F. sycomorus* was subjected to preliminary phytochemical screening, to identify the secondary metabolites present. The methods of analysis employed were those described by Brian and Turner (1975).

Acute toxicity study

The LD_{50} of the methanol extract of *F. sycomorus* was determined by methods of Lorke (1983) using 15 rats in the first phase. The animals were fasted for 2 h before the study, but were given water *ad libitum*. In this phase, rats were divided into three groups of three rats each and were treated with the methanol extract of the specimen at different doses of 10, 100 and 1000 mg/kg (body weight) intraperitoneally. They were observed for 24 h for signs of toxicity. In the second phase, 12 rats were divided into four groups of three rats each and were treated with the extract doses of 1500, 2900, 4000 and 3000 mg/kg (body weight). The LD_{50} was calculated using appropriate formula.

Induction of diabetes mellitus

Alloxan monohydrate is one of the chemical agents used to induce diabetes by partial destruction of beta-cells of Islets of Langerhans (Abdel Barry et al., 1997). This results in decreased insulin levels and hyperglycaemia leading to type I or sometimes chronic type II diabetes mellitus. Alloxan monohydrate was dissolved in 6 ml of normal saline which is still 150 mg/kg. The rats were weighed accordingly and calculations were made for the various loadings. The animals were fasted from feeds for 12 h before the commencement of each experiment but were given water *ad libitum*. After loading, the rats were kept for the next 24 h on 5% glucose solution bottle in their cages to prevent hypoglycaemia. After a period of two weeks, the rats with blood glucose levels greater than 150 mg/dl were considered diabetic and used for this research work (Stanley et al., 2001).

Experimental design

The alloxan-induced Wistar diabetic rats were randomly assigned into four groups of six rats (n = 6) each as follows: Group 1 received 250 mg/kg (body weight) of the extract, Group 2 received 500 mg/kg (b.w), Group 3 received 1000 mg/kg (b.w), while Group 4 received normal saline (intraperitoneally).

Determination of blood glucose levels

All blood samples were collected by cutting the tail-tip of the rats. Blood samples for glucose determination were collected from the trials at intervals of 0, 2, 4, 8 and 24 h. Determination of the blood glucose levels was done by the Glucose Oxidase Principle (Beach and Turner, 1975) using the one Touch Basic (Life Scan, Milpitas, CA) instrument and results were reported as mg/dl (Rheney and Kirk, 2000).

RESULTS AND DISCUSSION

The rate was observed for 24 h for signs of dizziness, inaction or death which normally results from the toxic nature of the plant extract. It was found that, the methanol extract of *F. sycomorous* is very less toxic even at a dose of 5000 mg/kg (bw) (detailed data not shown). Thus, the LD_{50} was calculated as 30% of the highest dose which in this study is 1500 mg/kg (bw). From the results (Table 1), the glucose concentration in diabetic rats changes at different time intervals after interaperitoneal administration of stem-bark extract of *F. sycomorus* at doses of 250, 500 and 1000 mg/kg (bw); but the

Table 2. Phytochemical analysis results of fractions obtained from methanol extract of *F. sycomorus*.

Plant fraction	Methanol
Saponin	+
Alkaloids	+
Tannins	+
Glycosides	+
Flavonoids	+
Resins	+

+, Present.

change was significant ($P<0.05$) at 250 mg/kg (bw) at 8 and 24 h. The dose of 250 mg/kg (bw) brought the blood glucose level in diabetic rats almost to the normal as compared to diabetic control (to values similar to those of healthy control rats). This could be due to an improvement of insulin response to glucose levels. The hypoglycaemic effect of the methanol extract of stem-bark extract of *F. sycomorus* was not dose-dependent (Table 1). This could be due to antagonism. The extract contained many secondary metabolites, some of which could by antagonistic (Table 2). Therefore, at low doses, the concentration of these antagonistic molecules was low. Thus, offering no hindrance to the antidiabetic substances present in the extract. A similar observation was reported on the hypoglycaemic effect of bark extract of *Pterocarpus santalinus* on blood glucose concentration in streptozotocin-induced diabetic rats (Kameswara et al., 2002).

The phytochemical analysis results (Table 2) of the methanol extract of the stem-bark of *F. sycomorus* revealed the presence of flavonoids, saponins, alkaloids, reducing sugars, glycosides, etc. Some flavonoids and glycosides have been found to stimulate β-cells regeneration, increase insulin secretion or possess an insulin-like effect (Lamba et al., 2000; Cetto et al., 2000; Mahesh and Menon, 2004).

In conclusion, the present study suggested that, methanol extract of stem-bark of *F. sycomorous* at the dose of 250 mg/kg had a significant hypoglycaemic activity. Further work is recommended to evaluate its effects on serum lipids, kidney functions, etc.

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