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Full Length Research Paper

Effect of *Nauclea latifolia* leaves aqueous extracts on blood glucose levels of normal and alloxan-induced diabetic rats

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In Northern Nigeria, different parts of *Nauclea latifolia* (family: Rubiaceae) are prescribed as remedy for diabetes mellitus. This study was designed to evaluate the hypoglycemic property of aqueous extract of the leaves of the plant in normal and alloxan-induced diabetic rats. The aqueous extracts at (200 mg/kg bw.) significantly lowered glucose levels ($p<0.05$) of the diabetic rats by 45% within 4 h but showed no similar effect in normoglycaemic rats. This finding suggest that aqueous extract of the leaves of *N. latifolia* posses hypoglycaemic activity to warrant further detailed study to elucidate its therapeutic, toxicological and phytochemical properties.

Key words: *Nauclea latifolia*, hypoglycaemic activity, alloxan-induced diabetes.

INTRODUCTION

Nauclea latifolia (family: Rubiaceae) commonly known as pin cushion tree is a straggling shrub or small tree native to tropical Africa and Asia. Parts of the plant are commonly prescribed traditionally as a remedy for diabetes mellitus. The plant is also used in the treatment of ailments like malaria (Kokwaro, 1976; Akabue and Mittal, 1982; Boye, 1990), gastrointestinal tract disorders (Maduabunyi, 1995), sleeping sickness (Kerharo, 1974), prolong menstrual flow (Elujoba, 1995), hypertension (Akabue and Mittal, 1982) and as a chewing stick (Asubiojo et al., 1982). However, there are no empirical data or scientific reports to support the antidiabetic effect of the plant. The present study was designed to test the hypoglycemic effect of aqueous extracts of the leaves of *N. latifolia* in normoglycaemic and alloxan-induced diabetic rats.

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MATERIALS AND METHODS

Plant material

Fresh leaves of *N. latifolia* were collected from the Ahmadu Bello University main campus. The plant was identified at the herbarium unit of Biological sciences, Department, A. B. U. Zaria where a voucher specimen (No. 1268) has been deposited.

Extract preparation

The fresh leaves collected were dried under the shade and ground into powder. The powder (100 g) was boiled in 2 L of distilled water for 30 min. The extract was cooled, filtered and evaporated to dryness in water bath at 50°C.

Animals

White wistar strain albino rats (150-200g) bred in the faculty of Veterinary Medicine, A. B. U. Zaria were used for the study. They were fed *ad libitum* with a commercial feed (feedex Nig. Ltd. Kaduna, Nigeria) and water.

Table 1. Effect of aqueous extract of the leaves of *N. latifolia* (200 mg/kg), glibenclamide (1 mg/kg) and water on blood glucose (mg/dl) levels of normoglycaemic rats.

Treatment	Initial glycaemia (0 h)	% Glycaemic change			
		1 h	2 h	3 h	4 h
Control	59.40 ± 1.53	+2.32 ± 4.41[a]	+3.50 ± 3.40[a]	-3.08 ± 8.82[a]	+4.13 ± 1.22[a]
N. latifolia Extract	58.45 ± 2.01	+14.91± 4.59[a]	+11.69 ± 2.91[a]	+14.43 ± 4.60[a]	+19.08±5.82[a]
Glibenclamide	58.83 ± 6.85	-14.11 ± 1.61[b]	-30.93 ± 3.01[b]	-42.35 ± 4.97[b]	-37.24 ± 2.78[b]

Values are mean ± SEM of 6 replicate determinations.
Means with different superscript letters on the same vertical column are significantly different ($p<0.05$).

Experimental design

The study was carried out on non-diabetic and alloxan-induced diabetic rats. The rats were fasted for 18 to 24 h before each experiment, and blood samples were collected from the tail of the rats.

Induction of diabetes

Diabetes was induced by a single intraperitoneal injection of 150 mg/kg of alloxan monohydrate dissolved in normal saline after an overnight fast. After 2 weeks, surviving rats with blood glucose more than 200 mg/100ml were considered as alloxan-induced diabetic rats.

Evaluation of hypoglycaemic activity

Non-diabetic rats

Fasting blood glucose concentration was first determined in overnight fasted rats following which the extract (20 mg/ml) was administered orally at a dose of 200 mg/kg via a BMI feeding tube (size 8). Blood glucose values were then estimated hourly for 4 h. Control rats received distilled water in place of the extract. Similarly, a standard antidiabetic drug (Glibenclamide 1 mg/kg) was administered orally to another set of rats and glucose determined at the same time intervals for the same duration according to the procedure of Aderibigbe et al. (2001).

Alloxan-induced diabetic rats

Aqueous extracts of the leaves (20 mg/ml) was orally administered to the diabetic rats at a dose of 200 mg/kg after determining their initial fasting blood glucose concentration. The blood glucose concentration was then assayed at one hour interval for 4 h. Distilled water was administered in place of the extract for the control studies. A standard antidiabetic drug (Glibenclamide 1mg/kg) was similarly administered to the diabetic rats, blood glucose concentration determined at the same interval for the same duration.

Determination of blood glucose

Blood was collected in fluoridated tubes and the serum harvested by centrifugation at 3000 g for 10 min. Serum glucose concentration was determined based on the principle of Trinder (1969) using glucose oxidase kit (Randox, UK.). Percentage glycaemic change was then calculated using the following formula:

$$\% \text{ Glycaemic change} = \frac{\text{Glucose concentration (1, 2, 3 or 4 h)} - \text{fasting blood glucose} \times 100}{\text{Fasting blood glucose}}$$

Statistical analysis

The results are presented as Mean ± SEM. Student's t- test was used to statistically analyse the data and differences were considered significant at ($p<0.05$).

RESULTS AND DISCUSSION

The percentage change in blood glucose levels of non-diabetic rats at different time intervals after oral administration of water, *N. latifolia* leaves extract or glibenclamide is shown in Table 1. The extracts caused a slight but insignificant increase ($p< 0.05$) in blood glucose levels of the rats from the first hour of administration. Glibenclamide, on the other hand, significantly lowered the blood glucose levels ($p<0.0.5$) within 1 h.

Percentage glycaemic change in blood glucose levels of diabetic rats after administration of water, *N .latifolia* leaves extracts or glibenclamide are shown in Table 2. The aqueous extracts of the leaves of *N. latifolia* caused a 19.5% decrease in blood glucose levels of the diabetic rats within 1 h of administration compared to 0.67% for glibenclamide within the same period. The maximal reduction of 44.5% was observed at 4 h while for glibenclamide the maximal reduction of 40 % was also observed at 4 h.

Administration of aqueous extract of the leaves of *N. latifolia* (200 mg/kg) significantly lowered blood glucose levels of alloxan diabetic rats ($p<0.05$) when compared with control rats treated with distilled water. The maximal reduction of 45% was observed at 4 h after administering the extract. Treatment of non diabetic rats with the same dosage, for the same duration, did not however, show the same hypoglycaemic activity. The hypoglycaemic activity

Table 2. Effect of aqueous extract of the leaves of *N. latifolia* (200 mg/kg), glibenclamide (1 mg/kg) and water on blood glucose (mg/dl) levels of alloxan-induced diabetic rats.

Treatment	Initial glycaemia (0 h)	% Glycaemic change			
		1 h	2 h	3 h	4 h
Control	284.43 ± 16.54	+5.28 ±2.35[a]	-2.84 ±1.72[a]	-3.64 ±1.20[a]	+1.22±0.70[a]
N. latifolia Extract	323.81± 39.56	-19.54±6.81[b]	-30.29 ± 4.92[b]	-43.80± 5.00[b]	-44.47± 7.44[b]
Glibenclamide	310.78 ± 30.21	-0.67 ±1.62[a]	-9.30 ± 2.23[c]	-19.57± 0.80[c]	-39.58±3.66[b]

Values are mean ± SEM of 6 replicate determinations.

Means with different superscript letters on the same vertical column are significantly different ($p<0.05$).

was not similar with that of glibenclamide, an oral hypoglycaemic drug that lower blood glucose in both normal and diabetic subjects (Subramoniam et al., 1996; Prince et al., 1999; Okyar et al., 2001; Rao and Rao, 2001).

However, it is not known how the aqueous extract of the leaves of *N. latifolia* exert its hypoglycaemic effect. Also not known are the chemical constituent(s) responsible for this effect. But it has been reported that *N.latifolia* contain alkaloids (Hotellier et al., 1991; Abreu and Pereira, 2001), terpenes (Morah, 1995) and some inorganic elements (Asubiojo et al., 1982). The present study suggests that aqueous extracts of leaves of *N. Latifolia* possess adequate antidiabetic properties to warrant further detailed therapeutic, phytochemical and toxicological evaluation. Thus, series of experiments are currently underway to elucidate the hypoglycaemic principle(s) of the plant.

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