

Effect of Aqueous-ethanolic Stem Bark Extract of *Commiphora Africana* on Blood Glucose Levels on Normoglycemic Wistar Rats

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Abstract: This study was undertaken to determine the hypoglycemic effect of *Commiphora africana* (family: Burseraceae) stem bark aqueous-ethanolic extract in normoglycemic Wistar rats. In one set of experiment, graded doses of *C. africana* stem bark aqueous extract (100, 200 and 400 mg/kg p.o) were separately administered to groups of fasted normal rats. The hypoglycemic effect of *C. africana* stem bark aqueous ethanolic extract was compared with that of Metformin (250 mg/kg) in fasted normal rats. Following treatment, relatively moderate to high doses of *C. africana* (100, 200 and 400 mg/kg p.o) produced a dose-dependent, significant reduction ($p < 0.05$) in blood glucose levels of fasted normal rats. Three doses of the extract (100, 200 and 400 mg/kg) were administered orally. A significant decrease in the blood glucose levels after 5 and 7 day of administration with the doses of 200mg/kg and 400mg/kg was observed when compared to control. As regards to the dose of 100mg/kg there was no any significant decreased in the blood glucose levels when compared to control. The Preliminary phytochemical screening revealed the presence of alkaloids, tannins, flavonoids, steroids and saponins. The median lethal dose (LD_{50}) in rats was calculated to be 3807.8 mg/kg body weight. In conclusion the aqueous ethanolic extract of *Commiphora africana* possesses hypoglycemic activity in normoglycemic rats.

Key words: *Commiphora africana*, hypoglycemic activity, phytochemicals.

INTRODUCTION

Administration of various plant extract for the reduction of blood sugar levels of diabetics comprises an important aspect of the indigenous medicinal systems of many countries including Sri Lanka (Jayaweera, 1982). Most of the plants prescribed for diabetes mellitus (DM) are not edible (Atta-ur-Rahman and Zaman, 1989; Serasinghe *et al.*, 1990) and therefore the studies on edible plants which have a hypoglycemic effect would be of great value in the dietary management of the disease. The oral hypoglycemic activity of the stem bark of *commiphora africana* in normoglycemic healthy, Wistar rats become very imperative.

Commiphora africana belongs to the family of Burseraceae and a group of plant called Myrrh (Hanus *et al.*, 2005; Dalziel and Hutchinson, 1956) and it is found on dry sites and savannah forest of Africa (Irvine, 1961). It is traditionally used for the treatment of a number of ailment including the treatment of typhoid and wound healing (Lewis and Elvin-Lewis, 1977). *Commiphora africana* is a small tree, sometimes reaching 10 m but usually not more than 5 m high. It can be recognized unmistakably from a distance by its outline-a spherical top and a short trunk with low branches. Crown is rounded, with the branches ascending and then curving downwards. Many of the branchlets end in spines. The bark is grey-green, sometimes shiny, peeling in

membranous scales; slash red, pleasantly scented, exuding a clear gum. Has a creeping root system that spreads several meters around the tree. Leaves trifoliolate, leaflets cuneate at the base and with irregular and bluntly toothed margins, waxy grey-green above with a sparse covering of hairs, lighter in color and more densely hairy below, up to 4x2.5 cm, the middle leaflet larger than laterals. Flowers in axillary clusters of 4-10; petals 4, red, not fused, but forming a tube about 6 mm long. Fruits reddish, 6-8 mm across but sometimes larger, almost stalkless, made up of a tough outer layer, which splits when ripe to reveal a hard, furrowed stone embedded in a red, resinous flesh. The generic name 'Commiphora' is based on the Greek words 'kommi' (gum) and 'phero' (to bear). The specific name simply means African. The objective of this research work is to determine the effect of aqueous ethanolic stem bark extract of *commiphora africana* on blood glucose levels on normoglycemic wistar rats. This would help in contributing toward ethno botanical uses of *commiphora africana* in Nigeria.

MATERIALS AND METHODS

Plant Material: The stem bark of *commiphora africana* was collected within Main campus, Ahmadu Bello University, Zaria. The plant was identified and authenticated by M. Musa of the herbarium section in the Department of Biological Science, Ahmadu Bello

Table 1: Effect of aqueous ethanolic stem bark extract of *commiphora africana* on blood glucose levels of normoglycemic Wistar rats.

Treatment	Blood glucose levels(mg/dl)				
	Day 0	Day 1	Day 3	Day 5	Day 7
Control(normal saline)	68.5±2.6	85.8±4.8	84.1±4.3	88.5±3.5	82.8±2.3
Metformin250mg/kg	61.5±2.8	83.5±5.8	79.6±5.0	77.8±6.5	84.3±6.3
100 mg/kg	67.6±3.1	85.2±5.5 ^{ns}	77.8±8.7 ^{ns}	82.6±10.6 ^{ns}	86.3±3.1 ^{ns}
200mg/kg	65.0±7.8	82.3±8.2 ^{ns}	70.8±6.6 ^{ns}	59.5±6.2 ^{ns}	59.5±4.8 ^a
400mg/kg	62.0±4.2	71.5±3.8 ^{ns}	60.3±7.0 ^{ns}	62.5±7.9 ^{ns}	53.6±4.8 ^a

^a P< 0.05; a = significant, ns=not significant

University Zaria, where a herbarium specimen was prepared and deposited there with a voucher number (900300).

Extract Preparation: The stem bark of *commiphora africana* were collected and dried under shade and ground into powder. The powder (500 g) was macerated in 30% of distilled water and 70% ethanol at room temperature for 24 hours. It was then filtered using a filtered paper (Whatmann size no.1) and the filtrate evaporated to dryness in water bath at 60°C. A brownish residue weighing 30.5 g was obtained. This was kept in air tight bottle in a refrigerator until used.

Chemicals used: All chemicals and drugs used were obtained commercially and of analytical grade.
PHYTOCHEMICAL SCREENING.

A preliminary phytochemical screening of the stem bark extract of *commiphora africana* seed was also done using standard methods of analysis (Trease and Evans, 1989; Sofowora, 1992).

Acute toxicity study: LD₅₀ determination was conducted using the method of Lorke (1983). In the initial phase, Albino Wistar rats were divided into three groups of three rats each. They were treated with the *commiphora africana* stem bark extract at doses of 100, 100 and 1000 mg/kg per orally. Animals were observed for 24hours for any signs of toxicity. In the second phase of the toxicity study the animal were grouped into three groups of one rat each. They were treated with the *commiphora africana* stem bark extract at doses of 1600, 2900 and 5000 mg/kg per orally. Animals were observed for 24 h and there was mortality recorded.

Signs of the toxicity were first noticed after 5-8 h of extract administration. There were decreased locomotor activity and sensitivity to touch. Also there was decreased feed intake, tachypnoea and prostration after 12 h of extract administration. The LD₅₀ was calculated as 3807.8 mg/kg .

Animals used and experimental design: Thirty six (36) Wistar rats weighing between (120-150g) of about 20-25 weeks of age of both sexes was used and was obtain from the Animal House of the Department of Pharmacology and Clinical Pharmacy, A.B.U. Zaria. They were kept in plastic cages under laboratory condition of temperature and humidity and placed on standard feed and allow free access to water with 12 h light/dark cycle. The animals were fasted for 12-18 h with free access to water prior to the administration of the extract. Three

days after Alloxan injection, the blood glucose levels was measured using the glucose-oxidase principle and only those rats with fasting blood glucose greater than 200 mg/dL will be included in the study. (Stanley *et al.*, 2001).

The normoglycemic rats were randomly assigned into five groups (1-5) of six rats (n = 6) each as follows, namely:

- Group 1: Normal, treated Wistar rats (were given Normal saline, 5 ml/kg bodyweight p.o)
- Group 2: Normal treated with 100 mg/kg extract p.o
- Group 3: Normal, treated with 200 mg/kg extract p.o
- Group 4: Normal, treated with 400 mg/kg extract p.o
- Group 5: Normal, treated with metformin (250 mg/kg p.o) (Marta *et al.*, 2000; Solskov *et al.*, 2008).

Determination of blood glucose levels: All blood sample were collected from the tail artery of the rats at interval of 0, 1, 3, 5 and 7 days. Determination of the blood glucose levels was done by the glucose-oxidase principle (Beach and Turner,1958) using the ONE TOUCH Basic (Lifescan, MilpitasCA) instrument and results were expressed as mg/dL (Rheney and Kirk, 2000).

Statistical analysis: Blood glucose levels were expressed in mg/dL as mean ± SEM. The data were statistically analyzed using ANOVA with multiple comparisons versus control group by Dunnett's method. The values of p<0.05 were taken as significant.

Table 1. Effect of aqueous ethanolic stem bark extract of *commiphora africana* on blood glucose levels of normoglycemic Wistar rats.

Table 1 showed the results of the effect of three doses (100, 200 and 400 mg/kg) of aqueous ethanolic stem bark extract of *commiphora africana*, metformin and control groups in normoglycemic Wistar rats. The dose of metformin and 100mg/kg of the extract did not show any significant change in blood glucose levels when compared to the normal treated control group. However, the doses of 200 and 400 mg/kg of the extract showed a significant (p<0.05) decrease in the blood glucose levels after day 5 and 7.

RESULTS

Phytochemical screening: Result of the preliminary phytochemical screening of *commiphora africana* stem bark extract revealed the presence of flavinoids, tannin, anthraquinone, cardiac glycosides alkaloids, triterpenoids, saponins, and reducing sugars.

Acute toxicity study: Signs of the toxicity were first noticed after 5-8 hours of extract administration. There were decreased locomotor activity and sensitivity to touch. Also there was decreased feed intake, tachypnoea and prostration after 12 hours of extract administration.

The LD₅₀ was calculated is 3,807.8 mg/kg by the log-probit using the method of Miller and Tainter

DISCUSSION

The major classes of synthetic oral hypoglycemic agents currently available for the management and/or control of adult-onset, NIDDM, type-2 diabetes mellitus include the sulphonyureas, biguanides, thiazolidinediones, and alpha-glucosidase inhibitors and so on. *Commiphora africana* have been shown to have hypoglycemic potential in normoglycemic Wistar rats by possibly stimulating the β -cells and or due to its insulin-like activity. *C. africana* at doses of 100 200 and 400 mg/kg is shown in Table 1. In relation to the normal rats that received 100 mg/kg body weight of the extract of *C. africana*, there was no significant change in the blood glucose levels when compared to the control. In regard to the dose of 200 and 400 mg/kg, it significantly ($p < 0.05$) lowered the blood glucose level when compared to control after day 5 and 7 of extract administration.

A number of investigators have shown that coumarin, flavonoid, terpenoid and a host of other secondary plant metabolites including arginine and glutamic acids possess hypoglycemic effects in various experimental animals model (Akah and Okafor, 1992; Marles and Farnsworth, 1995).

However, if the hypothesis of Marles and Farnsworth (1995) which stipulates that plant which contain terpenoid and/or coumarin possess hypoglycemic activities in diabetic and normal mammal, then it would seem reasonable to assume that, in part, at least, the hypoglycemic activity of the stem bark of *C. africana* may probably be due to terpenoid present, which appears to be involved in the stimulation of the β -cells and the subsequent secretion of preformed insulin. One or more of the other chemical constituents of the plant especially flavonoid is also likely to have played a crucial role in the hypoglycemic action of the plant extract.

In conclusion, the present study showed that aqueous ethanolic stem bark extract of *C. africana* possessed hypoglycemic properties in normoglycemic Wistar rats which suggest the presence of biologically active components which may be worth further investigation and elucidation. The effective hypoglycemic dose was found to be 400mg/kg weight. Further studies are currently under way to isolate and characterize the active components of the crude extract of this plant.

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