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EVALUATION OF HYPOGLYCEMIC ACTIVITY OF *MUSA PARADISIACA* L. (MUSACEAE) IN RAT

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ABSTRACT
The effect of the bulb and stem of *Musa paradisiaca* on blood glucose concentration in Normoglycemic and alloxan-induced diabetic rats was evaluated. 250, 500 and 1000 mg/kg body weight doses of each of the bulb and stem of the plant were orally administered to Normoglycemic and alloxan-induced rats. Blood glucose concentration was determined at 0, 1, 2 and 4 hours after treatment. While the bulb extract reduced glucose level only at 1000 mg/kg dose at 4 hours, all the doses reduced glucose level in the diabetic rats. On the contrary, the stem extracts increased blood glucose concentration only at 1000 mg/kg in both Normoglycemic and diabetic rats. The results showed that while the bulb extract of the plant could be used in ethno therapy of diabetes mellitus, the stem should not be used because of its hyperglycemic activity.
KEY WORDS: *Musa paradisiaca*, hypoglycemic, diabetes.

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INTRODUCTION

Musa paradisiaca is a member of Musaceae family and is popularly known as plantain. The plant is widely distributed in the southern part of Nigeria, West and East Africa, Malaysia, Cameroon and southern parts of United States of America[1,2]. The plant is rich in potassium and vitamins B6 and C. Several oligosaccharides comprising fructose, xylose, galactose, glucose and mannose are contained in the plant[3]. It is made up of 20 % starch (fresh weight) and 1% proteins. The plant contains about 180 aromatic substances, including isopentyl acetate which is the principal aroma bearer. *Musa paradisiaca* is known to have medicinal activity. It is recommended for treatment of urinary stone in Ayurverdic medicine. It has been reported that the stem dissolve preformed bones and prevent the formation of stones in the urinary bladder of rats. It is also used in nervous affectations like epilepsy, hysteria and in dysentery and diarrhea[3]. The root is said to have aphrodisiac property and is used for impotency in men. The root sap mixed with honey is also used to treat enlarged prostate[4]. The stem mixed with *Talinum triangulare* leaves is reported to treat measles[5]. Various species of Musa have been shown to possess hypoglycemic properties. The flowers and roots of *M. sapientum* showed hypoglycemic effect on normal fasting rabbits[6]. In southern Nigeria various parts of *M. paradisiaca* are used as hypoglycemic agents thereby making the evaluation of the hypoglycemic effect of the plant inevitable.

MATERIALS AND METHODS

Collection and Identification of Plant Materials

The bulb and stems of *M. paradisiaca* were collected from Ikot Ebido in Uyo, Akwa Ibom State, Nigeria in June 2007. the plant was identified and authenticated by Dr(Mrs.) U. Eshiet, a taxonomist in the department of Botany and Ecological studies, University of Uyo, Nigeria. Specimen voucher was deposited at the Herbarium of the Department of Pharmacognosy and Natural Medicine, University of Uyo, Nigeria.

Extraction of Plant Materials

The bulb and stems were chopped into bits and pounded with mortar and pestle. The juice was then extracted by means of a press and filtered using glass wool. The filtrate was then concentrated in vacuo and dried in a desiccator containing silica gel (self indicating) to obtain stem and bulb extracts, respectively.

Phytochemical Screening

Standard procedure according to 6 Evans and Trease (2005) were used to undertake phytochemical screening of the plant materials.

Animals

Albino rats (Wistar strain) of both sexes weighing 120 20.0g obtained from the animal house of Nigeria Institute of Trypanosomiasis Research (NITR) Vom, Jos, Nigeria were used. They were kept in the animal house of the University of Uyo under standard conditions of temperature (25^{o}C), 12 hour light and 12 hour dark cycle in steel cages. They had free access to water and food (Guinea feed pellets from Ewu, Edo State, Nigeria).

Induction of Diabetes

A single dose of 5% w/v freshly prepared alloxan monohydrate (150mg/kg) was intraperitoneally injected to overnight fasted rats. Blood glucose was determined five days after treatment. Rats with blood glucose concentration of > 10.0mmole/L were considered diabetic.

Administration of Extracts

Effect of extracts on blood glucose concentration in Normoglycemic rats

Twenty overnight fasted rats were divided into four equal groups, Group A, B and C received 250, 500 and 1000 mg/kg of the stem extracts, respectively. Group D which served as control received water only.

Another set of twenty overnight fasted rats were divided into four groups. Group A, B and C received 250, 500 and 1000 mg/kg of the bulb extracts, respectively. Group D which served as control received water only.

Effect of extracts on blood glucose concentration in alloxan induced diabetic rats

Twenty overnight fasted alloxan induced diabetic rats were divided into four equal groups, Group A, B and C received 250, 500 and 1000 mg/kg of the stem extracts, respectively. Group D which served as control received water only.

Another set of twenty overnight fasted alloxan induced diabetic rats were divided into four groups. Group A, B and C received 250, 500 and 1000 mg/kg of the bulb extracts, respectively. Group D which served as control received water only.

Estimation Of Blood Glucose

Blood was collected from the tail vein of the rats at 0, 1, 2 and 4 hours and glucose concentration was evaluated using One Touch Glucometer.

RESULTS

Results obtained are expressed in **Tables 1** and **2**. In Normoglycemic rats 1000mg/kg of bulb extract reduced concentration of glucose from 100 t0 70% at 4 hours only (Table 1). While the same dose of the stem extract increased it to 133. 8% at the same time point. No other dose of the two extracts affected glucose concentration significantly at $p<0.05$ (0.05) (Table 2).

All the doses (250, 500 and 1000mg/kg) of the bulb extract reduced glucose concentration tremendously (Table 1). The stem extract did not affect glucose concentration except 1000mg/kg dose which increased glucose concentration significantly at 2 and 4 hours (Table 2).

Phytochemical screening showed the presence of flavonoids, glycosides and absence of alkaloids, saponins, tannins, anthraquinones and terpenes in the stem. Tannins, saponins, glycosides were present in the bulb while alkaloids, anthraquinones, terpenes and phlobatannins were absent.

DISCUSSION

The bulb extract of *M. paradisiaca* lowered blood glucose concentration in Normoglycemic rats at 4 hours only at a dose of 1000 mg/kg. The blood lowering effect of the bulb extract in alloxan-induced diabetic rats was dose dependent. While the highest dose of 1000mg/kg reduced glucose levels at all time points (1, 2 and 4 hours), 500 mg/kg reduced glucose concentration at 2 and 4 hours, and 250mg/kg at 1hour only. This showed that the higher the dose the longer the duration of hypoglycemic activity. The lowest glucose concentration value was given by 1000mg/kg. The hypoglycemic activity of the bulb extract did not seem to be mediated through insulin stimulation or secretion by the pancreatic beta cell since the activity is more pronounced in the alloxan-induced diabetic rats where the beta cells had been destroyed.

On the contrary, the stem extract increased blood glucose concentration in both Normoglycemic and alloxan induced diabetic rats. The hypoglycemic effect was observed only at the highest dose (1000mg/kg). This results correlate with the report by Santosh et al (2007) that the dose of 500 mg/kg of the stem juice of *M. paradisiaca* produced a significant rise in blood glucose level in both normal and diabetic rats[7].

The results of this work showed that the bulb extract of *M. paradisiaca* possessed hypoglycemic activity in alloxan induced diabetic rats and could therefore be useful in the treatment on non-insulin dependent diabetes mellitus (NIDDM) or type 2 diabetes. While the stem extract exhibited hyperglycemic activity and its use in diabetes management may be detrimental.

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Table 1: Effects of bulb extract of *M. paradisiaca* on blood glucose concentration (mmole/l) in Normoglycemic and Alloxan- induced diabetic rats

Dose (mg/kg)		250	500	1000	Control
0 hour	Normoglycemic	2.26±0.27 (100)	2.66±0.49 (100)	2.89±0.69 (100)	2.59±0.17 (100)
	Diabetic	11.21±5.61 (100)	13.01±5.42 (100)	11.72±4.62 (100)	11.19±3.77 (100)
1hour	Normoglycemic	2.45±0.25 (108)	2.50±0.21 (94)	2.22±0.59 (77)	2.41±0.32 (93)
	Diabetic	4.77±2.11 (43)*	5.04±2.60 (39)	3.23±0.73 (28) *	8.17±0.45 (73)
2hours	Normoglycemic	2.49±0.39 (110)	2.42±0.14 (91)	2.16±0.67 (75)	2.12±0.48 (82)
	Diabetic	6.53±6.46 (58)	3.65±0.86 (28)*	3.20±0.56 (27) *	7.94±0.28 (71)
4hours	Normoglycemic	2.12±0.54 (94)	2.15±0.52 (81)	2.03±0.16 (70) *	2.58±0.36 (99)
	Diabetic	6.84±6.52 (61)	3.41±1.32 (26)*	2.72±0.26 (23) *	8.27±0.56 (74)

Mean±SEM n=5 * $p < 0.05$

Table 2: Effects of stem extract of *M. paradisiaca* on Blood glucose concentration (mmole/l) in Normoglycemic and Alloxan induced diabetic rats

Dose (mg/kg)		250	500	1000	Control
0 hour	Normoglycemic	3.24±0.41 (100)	3.16±0.36 (100)	3.14±0.45 (100)	3.10±0.70 (100)
	Diabetic	14.02±1.64 (100)	14.88±1.99 (100)	14.46±1.33 (100)	14.06±1.80 (100)
1hour	Normoglycemic	3.34±0.35 (103)	3.36±0.30 (106)	3.02±0.52 (96)	4.16±0.44 (134)
	Diabetic	12.54±3.02 (89)	13.45±2.81 (90)	18.60±2.33 (129)	13.66±0.64 (97)
2hours	Normoglycemic	3.72±0.21 (115)	3.60±0.47 (114)	3.58±0.49 (114)	3.58±0.32 (116)
	Diabetic	11.82±4.56 (84)	14.50±3.30 (97)	20.30±4.08 (140)*	12.12±9.37 (86)
4hours	Normoglycemic	2.46±0.78 (76)	2.12±0.40 (67)	4.20±0.53 (134) *	2.64±0.57 (85)
	Diabetic	11.78±4.52 (84)	11.03±4.77 (74)	17.83±5.14 (123)*	11.36±2.85 (81)

Mean±SEM n=5 * $p < 0.05$

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