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HYPOGLYCAEMIC EFFECT OF THE METHANOL EXTRACT OF IRVINGIA GABONENSIS SEEDS ON STREPTOZOTOCIN DIABETIC RATS.

Judith Laure Ngondi , Emile Joachim Djotsa, Zephyrin Fossouo, Julius Oben

Department of Biochemistry, P.O. BOX 812, Faculty of Science,
University of Yaounde I, Cameroon.

Email: jlngondi@yahoo.com, P.O. Box: 11445 Yaounde Cameroon, Tel: +237 767 13
75, Fax:+237 220 83 56

Abstract

The hypoglycaemic effect of the methanol extract of *Irvingia gabonensis* seeds (Irvingiaceae) was examined in streptozotocin-diabetic rats. A single oral administration of the methanol extract at doses of 150 and 250mg/kg significantly ($P < 0.001$) lowered the plasma glucose levels in diabetic rats two hours after treatment.

Key words: Hypoglycaemic effect, methanol extract, *Irvingia gabonensis* seeds, diabetic rats

Introduction

Irvingia gabonensis (Aubry -Lecomte ex O'Rorke) Baill, or bush mango is a medium sized tree. It belongs to the family Irvingiaceae (order-Rutales), a small tropical family containing two other genera (*Klaiedoxa*, *Desbordesia*) and the genus *Irvingia* which contains three species all occurring in West and central Africa. Two varieties of *Irvingia gabonensis* have been identified based on long phenological and reproductive phenological observations (Okafor,1975; Ladipo et. al. 1996). There are not many differences between the two species except for fruit sweetness and some tree morphological differences. The seeds of the fruits are used for soup thickening (White and Albernethy, 1996) and the leaves in the treatment of dysentery and for wound dressing (Okafor, 1975). In a previous publication, Ngondi et al. (2005) reported that

the seeds of *Irvingia gabonensis* reduced fasting blood glucose levels in obese subjects. The present study aims at investigating the effects of the methanol extract of *Irvingia gabonensis* seeds on blood glucose in diabetic rats.

Materials and methods

Animals

Male albino Wistar rats, 4-weeks-old (weighing 220-240g) were maintained on standard laboratory diet and tap water *ad libitum* at the Animal house of the Department of Biochemistry, Faculty of Science, University of Yaounde I, Cameroon. The experimental protocol was approved by the Animal Studies Committees of University of Yaounde I

Collection and preparation of plant material

Fruits of *Irvingia gabonensis* were collected in the month of August 2001 in a village around Ebolowa, in the South province of Cameroon. Botanical identification was performed at the National Herbarium, Yaounde, Cameroon. The seed were removed and carefully washed with water and dried in an oven (50°C) for 3 days. The seeds were ground and extracted with methanol. The percent yield was 0.8%.

Induction of experimental diabetes

The baseline plasma glucose levels were determined prior to induction of diabetes. Diabetes was induced by intra peritoneal injection of streptozotocin (60 mg/kg body weight in 50mM Citric buffer, pH 4.5) to overnight fasted rats, control rats received only the Citric buffer. They were left for 2 days at the end of which the blood glucose levels were determined using the Trinder's glucose oxidase method (1969). The streptozotocin-induced diabetic rats with fasting blood glucose of 200mg/dl or higher were used and divided into four groups of six male rats each. The test groups received 150, 250 mg/kg of the methanol extract or a reference drug, glibenclamide (5mg/kg body weight) in the same vehicle while the control group received appropriate volumes of water orally respectively. At 0, 30, 60, 90, and 120min, a blood sample from the tail vein of the rats was dropped on the reagent pad of the one touch strip (Life Scan Inc. Milpitas, California, USA). The strip was inserted into a one-touch brand meter and the reading noted (WHO, 1980).

Statistical analysis.

All values are expressed as mean blood glucose levels \pm SEM (standard error of mean). Data were analyzed by one-way ANOVA, and then differences among means were analyzed using the Fisher's protected LSD test. Differences were considered significant at $P < 0.05$.

Results and Discussion

The methanol extract was found to contain flavonoids, glycosides, tannins and saponins. The hypoglycaemic effects of 150, 250 mg/kg of the methanol extract of *I. gabonensis* seeds are shown on Table 1. The extract showed a dose dependent hypoglycaemic activity. The peak activity of the extract was observed at 120 min post drug administration. The doses 150 and 250 mg/kg of the extract showed percentage decreases from the initial value, of 38.07% and 51.95% respectively. Like the plant extract, glibenclamide also produced a significant reduction in the blood glucose levels. The mechanism of action of this hypoglycaemic effect of the extract is not elucidated in this study but we found activity comparable to the hypoglycaemic action of glibenclamide which acts by stimulating insulin release and the inhibition of glucagon secretion (Jackson et al 1981). Some medicinal plants with hypoglycaemic properties are known to increase circulating insulin levels in normoglycaemic rats (Erah et al. 1996).

Table 1: Time course of the hypoglycaemic effect of the methanol extract of *Irvingia gabonensis* on streptozotocin-diabetic rats.

Time (min)	Treatment			
	Water 4ml/kg	Glibenclamide 5mg/kg	<i>Irvingia gabonensis</i>	
			150mg/kg	250mg/kg
0	285 \pm 3.0	279 \pm 5.0	276 \pm 7.2	284 \pm 3.1
30	285 \pm 3.0	272 \pm 6.3(2.5%)	265 \pm 3.2 (3.9%)	271 \pm 5.6*(4.57%)
60	276 \pm 7.2*	259 \pm 9.0*(7.16%)	251 \pm 7.3 (9.05%)	252 \pm 12** (11.26%)
90	282 \pm 3.4	251 \pm 10.1*(10.03%)	246 \pm 9.0 (10.86%)	235 \pm 6.0*(17.25%)
120	283 \pm 3.9	242 \pm 14.4**(13.21%)	231 \pm 11*(16.30%)	223 \pm 8.1**(21.47%)

Blood glucose concentrations are expressed as mean + SEM.

* $P < 0.05$; ** $p < 0.01$ when compared to 0 hr level in the respective group.

A plausible mechanism of action is that the extract might have stimulated the residual pancreatic beta-cell function or produced the hypoglycaemia through an extra-pancreatic mechanism (Kameswararao et al. 2003). The hypoglycaemic effect produced by the methanol extract of *Irvingia gabonensis* seeds may be due to the glycosides, flavonoids, tannins and saponins present in the extract (Oliver, 1980). Further study is needed to characterise the active hypoglycaemic principles and to elucidate the mechanism of action.

References

1. Erah, P.O., Osuide, G.E., Omogbai, E.K.I. (1996). Hypoglycaemic effect of the extract of *Solenostemon monostachys* leaves. *J West Afr Pharm* , **10**:21-7.
2. Jackson, J.E., Bressler, R. (1981). Clinical pharmacology of sulphonylurea hypoglycaemic agents. Part 1. *Drugs* **22**: 211-245.
3. Kameswararao, B., Kesavulu, M.M., Apparao, C. (2003). Evaluation of antidiabetic effect of *Momordica cymbalaria* fruit in alloxan-diabetic rats. *Fitoterapia*, **74**: 7-13.
4. Ladipo D.O., Fondoun, J. M., Ganga, N. (1996). Domestication of the bush mango (*Irvingia* spp): some exploitable intra specific variations in West and Central Africa. In proceedings of an FAO ICRAF-IUFRO proceedings (Non-wood Forest Products FAO NO 9.
5. Ngondi, J.L, Oben, J.E, Minka, S.R. (2005). The effect of *Irvingia gabonensis* seeds on body weight and blood lipids of obese subjects in Cameroon. *Lipids Health Disease*, **4**:12 .
6. Okafor J. and Okolo, H.C. (1974). Potentials of some indigenous fruit trees of Nigeria. Paper presented at the 5th Annual Conference of the Forestry association of Nigeria Jos (1974) pp 60–71.
7. Oliver B. (1980) Oral hypoglycaemic plants in West Africa. *J Ethnopharm*, **2**:119-27.
8. Trinder P. (1969). Determination of glucose in blood using glucose oxidase with an alternative oxygen acceptor. *Ann Clin Biochem*, **6**: 24.
9. White, L., Albernethy, K. (1996) Guide de la végétation de la réserve de la Lopé, Gabon; ECOFAC Gabon.
10. World Health Organization (WHO), (1980). Expert committee on Diabetes Mellitus: Second Report. Technical Report Series Number 646, World Health Organization, Geneva, P. 61.