

## COMPARATIVE HYPOGLYCAEMIC EFFECTS OF ETHANOLIC AND AQUEOUS EXTRACTS OF THE LEAF AND SEED OF *TELFAIRIA OCCIDENTALIS*

Olorunfemi A. ESEYİN<sup>1\*</sup>, Patrick EBONG<sup>2</sup>, Eyong U. EYONG<sup>2</sup>, Emem UMOH<sup>3</sup>, Oladoja AWOFİSAYO<sup>1</sup>

<sup>1</sup>University of Uyo, Faculty of Pharmacy, Department of Pharmaceutical and Medicinal Chemistry, P. O. Box 4274, Uyo, Akwa Ibom State, NIGERIA

<sup>2</sup>University of Calabar, Faculty of Basic Medical Sciences, Department of Biochemistry, NIGERIA

<sup>3</sup>University of Uyo, Faculty of Pharmacy, Department of Pharmacology and Toxicology, NIGERIA

### Abstract

*The hypoglycaemic activity of ethanolic extracts of the leaf and seed of Telfairia occidentalis were compared. Effect of ethanolic and aqueous extracts of the leaf and seed of the plant on blood glucose concentration in rats was also compared. The extracts were administered orally to white albino rats (Wistar strain) and blood was collected from the tail vein of the rats and glucose concentration determined at 0, 1, 2 and 4 hours after treatment with One Touch glucometer. The results showed that aqueous extracts of leaf and seed of the plant did not lower blood glucose concentration at the dose administered (500 mg/kg). The ethanolic leaf extracts reduced blood glucose concentration significantly while the ethanolic seed extract did not. It could therefore be concluded that the hypoglycemic component(s) of Telfairia occidentalis is/or are in higher concentration in the leaf than the seed, and is better extracted by ethanol than water.*

**Key words:** Cucurbitaceae, *Telfairia occidentalis*, Aqueous and Ethanolic extracts, Hypoglycaemic

### ***Telfairia occidentalis*'in Yaprak ve Tohumlarının Etanollü ve Sulu Ekstrelerinin Hipoglisemik Etkilerinin Karşılaştırılması**

*Telfairia occidentalis yaprak ve tohumlarının etanollü ekstrelerinin hipoglisemik aktiviteleri karşılaştırılmıştır. Bitkinin yaprak ve tohumlarının sulu ve etanollü ekstrelerinin ratlarda kan glikoz konsantrasyonu üzerine olan etkileri de ayrıca karşılaştırılmıştır. Ekstreler beyaz albino ratlara (Wistar cinsi) oral olarak uygulanmış, kan örnekleri ratların kuyruk venlerinden toplanmış ve glikoz konsantrasyonları uygulamadan sonra 0, 1, 2, ve 4. saatlerde "one touch glucometer" ile ölçülmüştür. Sonuçlar bitkinin yaprak ve tohumlarının sulu ekstrelerinin uygulanan dozda (500 mg/kg) kan glikoz konsantrasyonunu azaltmadığını göstermiştir. Yaprak etanol ekstreleri kan glukoz konsantrasyonunu belirgin olarak azaltırken tohum etanol ekstresi azaltmamıştır. Bu nedenle, Telfairia occidentalis hipoglisemik bileşenlerinin yaprak içerisinde tohumdan daha yüksek konsantrasyonlarda bulunduğu ve su yerine etanol ile daha iyi ekstrakte edilebildiği sonucuna varılmıştır.*

**Anahtar kelimeler:** Cucurbitaceae, *Telfairia occidentalis*, Sulu ve etanolik ekstraktlar, Hipoglisemik

\*Correspondence: Tel: +2348023291687, E-mail: femiabraham@yahoo.com

## INTRODUCTION

*Telfairia occidentalis* Hook. f. is a member of the Cucurbitaceae family. It is popularly known as fluted pumpkin, oyster nut and fluted gourd. The United States department of Agriculture gave the Integrated Taxonomic Information System (ITIS) Taxonomic serial number to the plant as 505897. The crop is extensively cultivated in Southern Nigeria especially by the Igbos among whom it is fast becoming an important vegetable crop (1). The leaves are nutritious and used mainly as vegetables (2). The seed is also eaten as food (3,4). In addition to its nutritional value, the plant also has agricultural and industrial importance(5-9). The various medicinal uses of the plant have also been reported by several researchers,(10-15) but the use of the plant in the treatment of anaemia is most popular. The hypoglycemic, antihyperglycaemic or antidiabetic activity of the leaf and seed of *T. occidentalis* have been documented (16-20). In this work, the hypoglycemic effect of the water and ethanolic extracts of the leaf and seed were compared to determine which had the highest hypoglycaemic activity.

## MATERIALS AND METHODS

### *Plant material*

The leaves and fruit of *Telfairia occidentalis* were collected from the medicinal plant garden of the Faculty of Pharmacy, University of Uyo, Nigeria in March 2007. The plant was identified in the department of Pharmacognosy and Herbal Medicine of the same faculty by Dr Kola Ajibesin.

### *Plant preparation and extraction*

Fresh leaves was chopped into smaller bits and ground with a mortar and pestle. The leaf material was divided into two. One part was macerated in 96% ethanol for 24 hours while the second part was macerated in distilled water for 24 hours. The extracts obtained were filtered and concentrated *in vacuo* to obtain the aqueous and ethanolic leaf extracts.

The fruits were sliced open and the seeds evacuated. The seeds were chopped into smaller bits after the outer coating of the seed had been removed. The seed material was divided into two parts. One part was macerated with 96% ethanol for 72 hours while the second part was macerated with distilled water for 24 hours to obtain ethanolic and aqueous seed extracts, respectively. The extracts were filtered and concentrated *in vacuo*. All the extracts were dried in a desiccator containing silica gel (self indicating).

### *Animals*

White albino rats (200±28.5g) of both sexes obtained from the animal house of the University of Uyo, Nigeria were used. The rats were kept under standard laboratory condition with free access to food and water. The US guidelines (NIH Publication No. 85-23, revised in 1985) were duly followed in the handling of the rats.

### *Induction of diabetes*

Overnight fasted rats were injected with 5% freshly prepared alloxan monohydrate (150 mg/kg) intraperitoneally. Five days after treatment, blood glucose concentration of the rats was evaluated. Rats with blood glucose level of 9.5 mmol /L and above were considered diabetic.

#### *Administration of the extracts*

##### *Comparative hypoglycaemic effects of ethanolic leaf and seed extracts in normoglycaemic rats*

Three groups of overnight fasted normoglycaemic rats (five per group) were used. Groups A and B were separately given 500 mg/kg of ethanolic leaf and seed extracts orally. Group C served as control and was given water only. Blood glucose level was determined at 0, 1, 2 and 4 hours after extract administration.

##### *Comparative hypoglycaemic effect of ethanolic leaf and seed extracts in alloxan-induced diabetic rats*

Three groups of overnight fasted alloxan induced diabetic rats (five per group) were used. Groups A and B were separately given 500 mg/kg of ethanolic leaf and seed extracts orally. Group C served as control and was given water only. Blood glucose level was determined at 0, 1, 2 and 4 hours after extract administration.

##### *Comparative hypoglycaemic effects of ethanolic and aqueous extracts of the leaf and seed on alloxan-induced diabetic rats*

Twenty five alloxan-induced diabetic rats were divided into five equal groups. Groups A, B, C and D received orally 500 mg/kg of the ethanolic leaf, aqueous leaf, ethanolic seed and aqueous seed extracts, respectively. Group E was given distilled water only (control). Blood glucose level of rats in each group was determined at 0, 1, 2 and 4 hours after treatment.

#### *Estimation of blood glucose concentration*

Blood collected from the tail vein of the rats was analyzed for glucose using One Touch glucometer (Lifescan, U.S.A.).

#### *Statistical Analysis*

One way ANOVA was used to analyze the data obtained.

## **RESULTS AND DISCUSSION**

The ethanolic leaf extract (500 mg/kg) significantly reduced glucose level at 1 and 2 hours (85.8 and 83.2 %, respectively) in normoglycaemic rats and at 2 and 4 hours (75.0 and 45.1%, respectively) in alloxan diabetic rats. On the contrary, the ethanolic seed extract did not show significant hypoglycaemic activity in both normoglycaemic and alloxan diabetic rats (Tables 1 and 2). These results are in agreement with reports of previous work by Eseyin et al. (16, 19) that the leaf extract possessed hypoglycaemic activity. In another work, Eseyin et al. (20) reported the hypoglycaemic effect of ethanolic seed extract of the plant at a dose of 100 mg/kg while a higher dose of 250 mg/kg dose did not. It is therefore not surprising that 500 mg/kg of the ethanolic seed extract did not show significant glucose lowering effects. 500 mg/kg of aqueous extracts of the leaf and seed did not have significant effect on blood glucose level in the diabetic rats. But the ethanolic leaf extracts reduced glucose level significantly, 56.0 and 35.1 % at 2 and 4 hours, respectively (Table 1-3).

**Table 1.** Comparative effects of the ethanolic leaf and seed extracts (500mg/kg) on blood glucose levels in normoglycaemic rats.

	0 hour	1 hour	2 hours	4 hours
Control	2.90±0.23 (100)	3.39±0.26 (116.8)	3.45±0.32 (118.8)	2.91±0.24 (100.3)
Leaf	3.01±0.30 (100)	2.57±0.21 (85.8)*	2.50±0.29 (83.2)*	2.86±0.22 (95.3)
Seed	2.70±0.26 (100)	2.97± 0.20 (110.0)	2.76±0.30 (102.2)	2.47±0.20 (91.3)

Mean ± SEM, \* Significantly different from control, p < 0.05.  
Figures in paranthesis is percent of 0 hour value.

**Table 2.** Comparative effects of the ethanolic leaf and seed extracts (500mg/kg) on blood glucose levels in alloxan diabetic rats.

	0 hour	1 hour	2 hours	4 hours
Control	12.62±2.18 (100)	14.27±2.23 (113.1)	10.31±1.16 (81.7)	8.70±1.11 (68.9)
Leaf	12.91±2.23 (100)	13.17±2.31 (102.0)	9.68±1.27 (75.0)*	5.82±0.13 (45.1)*
Seed	12.55±2.25 (100)	12.55±2.33 (100)	11.85±3.24 (94.4)	9.39±1.31 (74.8)

Mean ± SEM, \* Significantly different from control, p < 0.05.  
Figures in paranthesis is percent of 0 hour value.

**Table 3.** Comparative effects of the ethanolic and aqueous extracts (500mg/kg) of the leaf and seed of diabetic rats.

	0 hour	1 hour	2 hours	4 hours
Control	9.70 ±1.76 (100)	10.26± 2.10 (105.8)	8.08± 2.00 (83.3)	5.83± 1.6 (60.1)
Leaf (ethanol)	10.3 ±1.99 (100)	6.43 ±1.34 (62.4)*	5.77± 1.22 (56.0)*	3.62± 0.56 (35.1)*
leaf (water)	10.7± 2.22 (100)	10.69± 2.41 (99.9)	10.19 ±3.12 (95.2)	6.86± 2.76 (64.1)
Seed (ethanol)	9.90± 2.01 (100)	7.35± 3.06 (74.2)	7.28±2.67 (73.5)	5.41±2.01 (54.6)
Seed (aqueous)	10.90± 2.34 (100)	11.92 ±3.33 (109.4)	11.78± 3.52 (108.1)	9.80± 2.35 (89.9)

Mean ± SEM, \* Significantly different from control, p < 0.05.  
 Figures in paranthesis is percent of 0 hour value.

These results show that the hypoglycemic principle of the plant is more concentrated in the leaf than the seed and are more extracted by ethanol than water. The hypoglycaemic principle may not be readily water soluble. This is contrary to the report by Nwozo et al. (18) who claimed that the aqueous extract of the leaf exhibited hypoglycaemic activity. It could therefore be concluded that the leaf is more useful than the seed in phytotherapy of diabetes and ethanol rather than water should be used to extract the leaf for better activity.

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