

Anti-Hypertensive Potentials of *Peperomia pellucida* (L.) HBK in Anaesthetized Normotensive Rats

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ABSTRACT

Peperomia pellucida (L.) HBK of the Family Piperaceae is used locally in Nigeria as an anti - hypertensive drug but its efficacy has not been established scientifically. This work is to demonstrate the anti-hypertensive effects of *Peperomia pellucida* extract on arterial blood pressure in male, normotensive rats. Normotensive rats were anaesthetized with pentobarbitone intraperitoneally and this was followed by intravenous administration of the extract. Intravenous administration of the extract produced marked fall in Mean Arterial Blood Pressure (MABP) and Heart Rate (HR). The hypotension lasted about 10 minutes. Pressor response to adrenaline was reduced (48.7%) by the extract but that of acetylcholine was not affected. This work has been able to justify the claim of the anti - hypertensive activity of *P. pellucida*.

Key words: *Peperomia pellucida*, Hypertension, Phytomedicine, Normotensive rats, Pentobabitone

INTRODUCTION

The literature is replete with information on the survey of traditional folk medicines in different parts of the world (Eddouks *et al* 2002; Phondani *et al* 2010; Ariwaodo 2012). The efficacy of many of the phytomedicines used particularly in developing countries has not been scientifically tested. *Peperomia pellucida* (L.) HBK (Piperaceae) is a plant of humid and shaded environment commonly found in the tropics. It is an erect, succulent and translucent annual herb of between 10 - 30cm high (Olorode, 1984; Akobundu, and Agyakwa, 1987).

Peperomia pellucida is reputed in herbal medicine as an anti-oxidant, anti-convulsant and analgesic. It is applied externally as a worm poultice to sores and boils and is used in the treatment of headache, small- pox, measles, and breast abscess (Ainslie 1937; Gbile *et al* 1990). *Peperomia pellucida* leaf extract was found by Wei *et al.* (2011) to possess vast potential drug in the treatment of breast cancer. However, in Southwestern Nigeria, many indigenous herbal practitioners use the plant for management of hypertension by eating it as vegetable with snail meat. Though the use of snail in the treatment of hypertension has been established, the bluish liquid obtained from snail has high iron content and is used for the treatment of hypertension as reported by Imevbore and Ademosun (1988). The present study was undertaken to verify whether an extract of *P. pellucida* was hypotensive in normotensive anaesthetized rats, and to determine its effect on blood pressure responses to adrenaline and acetylcholine.

MATERIALS AND METHODS

Plant materials

The plant was collected in Ibadan, Nigeria and was authenticated at the Forestry Research Institute of Nigeria (FRIN) herbarium, Ibadan where a voucher specimen was deposited.

Animals

Clinically healthy male albino Sprague-Dawley rats (100 – 150g) obtained from the Central Animal House, College of Medicine, University of Ibadan, Nigeria were used.

Preparation of extracts and phytochemical screening

Powdered aerial portion of the plant was refluxed with petroleum ether (8 hr) and methanol (8 hr) respectively. The methanol extract was concentrated almost to dryness under reduced pressure and then allowed to evaporate to dryness at room temperature. The methanol extract of *Peperomia pellucida* (MEP) was used for this study. Preliminary phytochemical screening was done following established procedures (Kokate *et al.*, 1996; Wagner and Bladt, 1996).

Measurement of arterial blood pressure and heart rate.

The rats were anaesthetized with pentobarbitone sodium (6mg/100g) intraperitoneally. Catheters were placed in a carotid artery for blood pressure measurement (with the aid of a transducer connected to a Grass Polygraph, Model 7D; calibration; 1cm = 50mmHg) and in a femoral vein for vehicle/drug administration. The trachea was also cannulated. Mean Arterial Blood Pressure (MABP) was calculated using the formula:

$$\text{MABP} = \text{Diastolic pressure} + 1/3 \text{ pulse pressure}$$

Where Pulse pressure = Systolic - Diastolic pressure

The heart rate was obtained from the pulsatile blood pressure tracings.

Pharmacological test

Rats were divided into five treatment groups of five rats per group. One group served as control and normal saline (1ml/ kg) was given. The remaining groups received different doses (1.56, 3.12, 6.25 and 12.50mg/kg) of the methanol extract of *P.*

Pellucida. The extract-treated rats and the control were subjected to the same feeding conditions and water was given freely. After a basal measurement of blood pressure and heart rate, each rat received normal saline or extract. Readings of blood pressure and heart rate were taken immediately following administration of extract and at 10 minutes interval for 30 minutes. In some rats, adrenaline or acetylcholine was given following administration of extract. This was meant to determine how the extract would affect pressure responses to either adrenaline or acetylcholine.

Statistical analysis

Statistical analysis was performed using t-test and significance was accepted at $P < 0.05$ while values are presented as mean \pm S.E.M.

RESULTS AND DISCUSSION

The phytochemical screening was positive to cardiac glycosides and alkaloids. These groups of secondary metabolites have been reported to be pharmacologically useful by Michael *et al.* (2002) hence their use in ethnomedicine could be justified. Cardenolides is a form of glycoside used medicinally as cardioactive drug. The therapeutic use of drugs for the treatment of heart failure is confined to a small group of plant glycosides that act directly on the heart muscle (Okwu and Ekeke, 2003). The presence of cardenolides and alkaloids is an indication that the plant could be a potential cure for cardiac arrhythmia.

Pre-treatment values of Mean Arterial Blood Pressure (MABP) and Heart Rate (HR) in the control and test rats were 108 ± 2.11 mmHg and 420 ± 10 beats/min. respectively. These initial values fell within the normal range for the species of rats used and the differences between control and test animals were not statistically significant thus making parallel comparison possible.

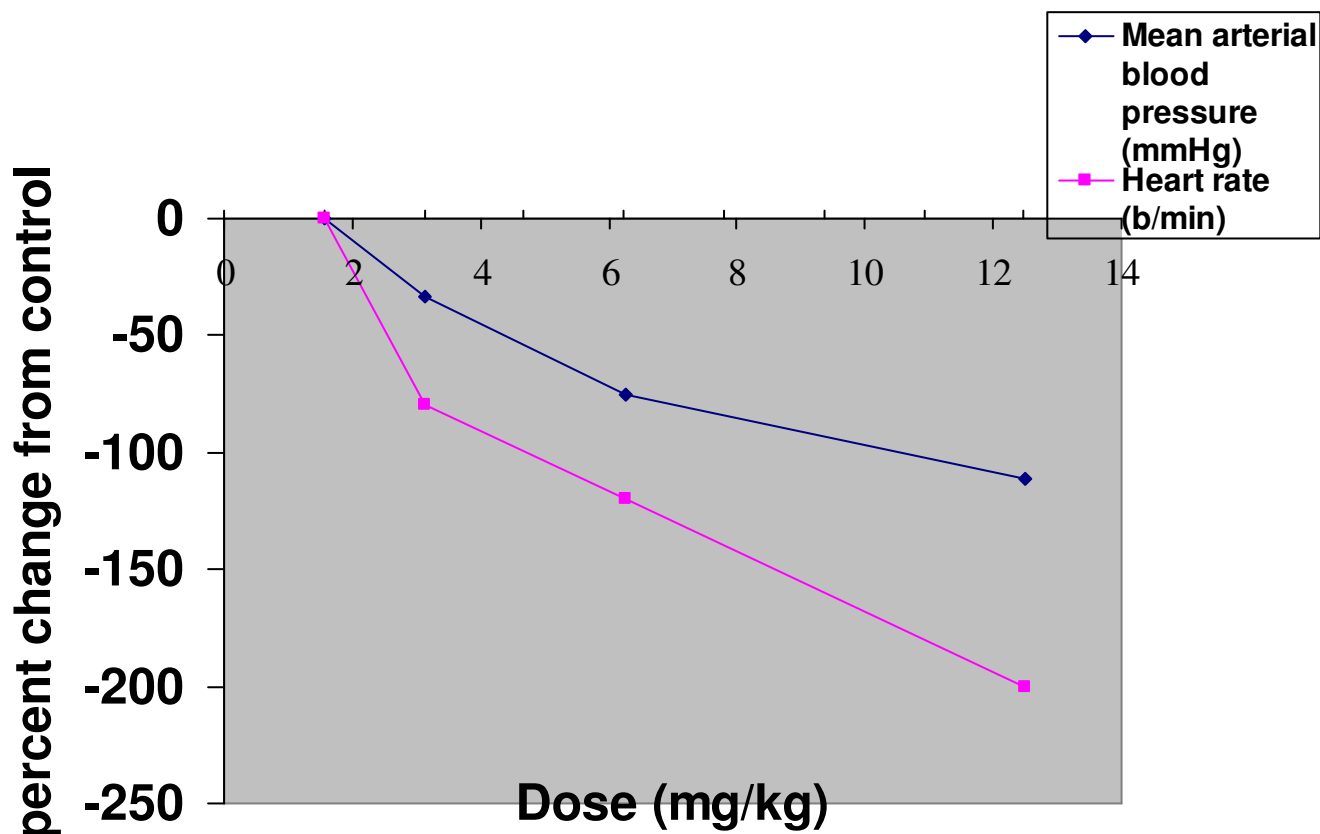


Fig. 1: Blood pressure responses of anaesthetized rats to doses of *Peperomia pellucida* extract. Points represent mean changes observed immediately after intravenous administration and each point corresponds to mean of five experiments.

Administration of increasing doses of the extract produced increasingly rapid falls in MABP and HR (Fig. 1). Although the effects produced by lower doses (1.56 and 3.12 mg/kg) were not significantly different from the control, those produced by higher doses (6.25 and 12.50 mg/kg) were significantly different from the control ($P \leq 0.05$). This indicates that at high doses the extract induced hypotension and bradycardia which are dose related. A similar antihypertensive finding in relation to dosages was observed by Bopda *et al.* (2014) who reported that

the aqueous extract of *Kalanchoe pinnata* leaf prevented significant increase of systolic and diastolic arterial pressure in higher dosage.

Table 1: The effect of *Peperomia pellucida* extract on mean arterial blood pressure (MABP; mmHg) and heart rate (HR; beats per min.) in anaesthetized rats.

Treatment	MABP Time (min.)				HR Time (min.)			
	1	10	20	30	1	10	20	30
Saline (0.9mM)	-4.0 ±1.2	-2.9 ±1.8	3 ±1.2	2.2 ±1.4	0.0 ±0.0	0.0 ±2.1	0.0 ±1.0	0.0 ±2.1
<i>Peperomia pellucida</i> (6.25mg/kg)	-75 [±] ±4.1	-2.4 ±2.2	-1.1 ±2.6	-0.3 ±1.1	-200 [±] ±20.4	0.0 ±1.9	0.0 ±2.4	0.0 ±0.4

± Significance compared with 0.9mM saline (P < 0.05)
 Data indicate percent change from pre – injection values.

When a screening dose (6.25mg/kg) was administered and MABP and HR were monitored for 30min.; there was a fall in MABP (-75 ± 4.1%) and HR (-200 ± 20.4%), five seconds following administration of the extract. These changes were statistically significant compared to the control (p ≤ 0.05). Ten minutes later, the pre-treatment values were re-stored and thereafter the values remained almost constant (Table 1). The short duration of action of the extract probably indicate that the compound(s) responsible for the activity of the extract is rapidly metabolized.



Fig. 2: Arterial blood pressure changes in response to adrenaline (Adr.) (1ug/kg) before (●) and after (○) administration of *Peperomia pellucida* extract (Pp) (6.25mg/kg). An interval of 5 min. was allowed in between drug administrations.

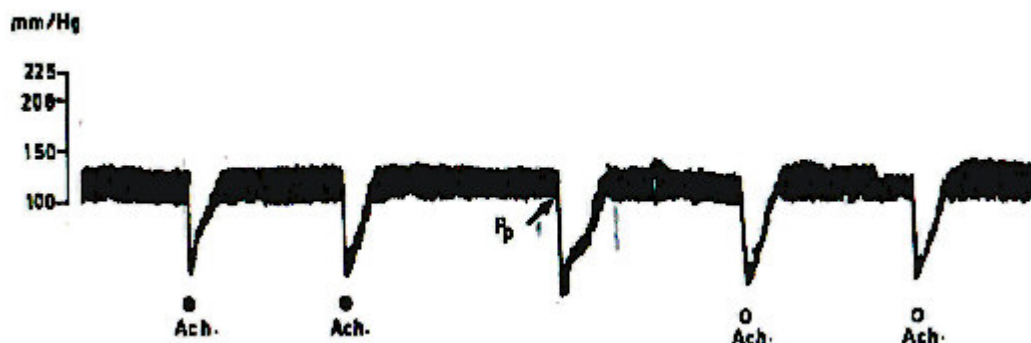


Fig.3: Arterial blood pressure changes in response to Acetylcholine (Ach.) (2ug/kg) before (●) and after (○) administration of *Peperomia pellucida* extract (Pp) (6.25mg/kg). An interval of 5 min. was allowed in between drug administrations.

The effect of the extract on pressor responses of anaesthetized rats to adrenaline and acetylcholine is shown in Figs. 2 and 3. As expected, adrenaline (1ug/kg) increased the MABP while acetylcholine (2ug/kg) depressed the MABP. After single dose of the extract (6.25mg/kg), pressor responses to adrenaline were reduced (48.7%) whereas; the hypotension caused by acetylcholine was neither enhanced nor inhibited. Hypotension may occur through stimulation of beta-adrenergic receptors (Goth, 1984). It could also occur through stimulation of cholinergic receptors causing bradycardia and a drop in the peripheral resistance leading to hypotension. Further, hypotension may occur through blockage of sympathetic pathway. It is obvious from the data obtained, that the extract had positive actions on both the heart and arterial blood pressure. The present findings further strengthen the current search for natural anti - hypertensive agents.

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