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## Hypotensive Effects and Acute Toxicity Property of Methanol Extract of *Baissea axillaris* Hau. Leaf on Animal Models

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**Abstract:** The hypotensive and acute toxicity activities of methanol extract of *B. axillaris* leaves, obtained by soxhlet extraction, were analyzed using animal models. The extract exhibited a dose-dependent reduction in rabbit blood pressure. Basal mean arterial pressure of 115.67±3.60 mm Hg was progressively reduced to 106.22±3.13 and 69.3±2.59 mm Hg by 2.5 and 20 mg kg<sup>-1</sup> doses of extract, respectively. Hematological parameters in Wistar rats treated with 1, 2 and 4 g kg<sup>-1</sup> of extract showed no significant difference, p>0.05. However, lethal dosage was obtained at 8 g kg<sup>-1</sup>. The need for further evaluation and prospect of the plant in health care was also discussed.

**Key words:** Hypotensive, acute toxicity, methanol extract, *Baissea axillaris*, leaf, animal models

### INTRODUCTION

Plants serve various purposes in this world. Their usefulness can be in form of food, shelter, textile, religious, medicines etc. (Fabeku, 2006). Over 40,000 species of tropical flowering plants have medicinal properties (Aibinu, 2006). The use of medicinal plants for both preventive and curative therapies is not new as records of indigenous knowledge from various parts of the world illustrate an age long tradition of plants being a major bioresource base for health care (Stepp and Moerman, 2001; Yesilada, 2005).

High blood pressure is a major risk factor for the development of cardiovascular complications including stroke congestive heart failure, peripheral vascular disorder and renal failure (Lloyd-Jones *et al.*, 2000). It is of relatively high prevalence in Nigeria where about 11% of the population was reported to have the disease condition (Mabadeje, 2002). Of the several pharmaceutical drugs presently used in its management today, none promise a permanent cure and there are often various complications arising from side effects of their use (Ayinde and Amaechina, 2005). Certain indigenous plants have been reported to possess blood pressure lowering activities in animal models (Amos *et al.*, 2003; Takahashi and Smithies, 2004; Kim *et al.*, 2006).

There is however, the need for proper scientific investigation of both beneficial and harmful effects of any medicinal plant (Olatunji-Bello and Awobajo, 2006; Idu *et al.*, 2006a). Toxicity testing of new drugs on animal models can be extrapolated to identify the relative

potential hazard it may have on man (Fabricant and Farnsworth, 2001). It helps to determine the upper limits of administration of effective therapy. If the toxicity is low then there is a chance of possible introduction of such a drug for therapeutic use (Ataman *et al.*, 2006). Most toxic effects of drugs occur at a predictable (usually short) time after administration: a basis for acute toxicity testing (Curtis, 2001).

The Urhobos (in the Niger Delta region of Nigeria) administer decoction of *Baissea axillaris* Hau. orally for the treatment of hypertension. Little has been done scientifically to justify the efficacy of this treatment, although Ayinde and Amaechina (2005) reported that the hypotensive property of the plant can be influenced by the solvent used in its extraction. Although no harmful or contraindication has been reported about its use among the natives, it is important to substantiate this with standard scientific trials.

*B. axillaris* belongs to the family Apocynaceae. It is a climbing perennial shrub. The leaves are 2.5-4 cm by 1.2-2.7 cm broad, glabrous on both surfaces, arranged in opposite pairs with short stipules. It exudes milky latex when plucked or cut. The apical and young stems are tender and brittle, becoming more ligneous and tough towards the base and with age.

The plant is often found interwoven with hedges, other woody supports (dead or alive) and fences (especially mesh-like iron fences) where it forms a thick evergreen mass of twisted stems and leaves above the ground. It thrives better in water-rich soil and ample supply of sunlight.

**MATERIALS AND METHODS**

*B. axillaris* was harvested in the month of March around Ugbowo axis, Benin City, Nigeria. The leaves were plucked off with bare fingers, cleaned off debris and dried in a Gallenkamp laboratory oven set at 40°C for 18-24 h. The dried, brittle leaves were pulverized in an electric mill.

Methanol was used to extract 3.5 kg of the powered leaves by soxhlet extraction. A rotary evaporator was used to concentrate the extract into a viscous paste (Somchit *et al.*, 2003). This was preserved in a properly covered bottle container and kept in a refrigerator till used for experiments.

For the hypotensive experiment, a total of 10 male rabbit weighing between 1.4-2.4 kg were purchased from Aduwawa market in Benin City and kept in the Animal house of Department of Pharmacology, University of Benin, feed with rabbit pellets and provided with water *ad libitum* and acclimatized for two weeks. Under general anaesthesia (urethane), the marginal ear vein was canulated with a 21-G scalp vein canula fixed to a three way stop tap. Subsequent intravenous administrations of doses saline were via this route.

The carotid artery was similarly canulated with a butterfly canula connected to a DC powered Ugo Basile double or 2-channel recorder via a transducer. The animal was then left undisturbed and observed for about 20 min and basal blood pressure was noted

Graded doses of the extract (2.5, 5.0, 10 and 20 mg kg<sup>-1</sup>) from a stock preparation of 50 mg mL<sup>-1</sup> were administered at regular time interval for drug effects to be observed. This procedure was repeated for five replicates.

A possible mechanism of hypotensive activity was investigated by the prior administration of 1 mg kg<sup>-1</sup> atropine and after 20 min, administered graded doses of the extract. A similar test was conducted using 1 mg kg<sup>-1</sup> of chlorpheniramine in place of atropine.

To determine the acute toxicity, fifteen male Wistar rats were purchased from animal unit of the Department of Microbiology, University of Benin, Benin City. They were distributed equally in 5 groups. Average weight per group ranged between 200-250 g. Each rat in groups 2, 3, 4 and 5 were administered the extract, intraperitoneally, in doses of 1, 2, 4 and 8 g kg<sup>-1</sup> body weight respectively while the control (group 1) received 2 mL normal saline. All 5 groups were allowed unrestricted access to feed and observed for 48 h. Blood samples were collected by cardiac puncture from each of the surviving rats and analysed for haematological parameters using a hema-auto-analyser and the results subjected to Duncan multiple comparison test.

**RESULTS AND DISCUSSION**

Table 1 reveals that the Mean Arterial Pressure (MAP) of rabbit was significantly and progressively reduced from a basal level of 115.67±3.60 to as low as 69.33±2.59 at the highest dose of extract, 20 mg kg<sup>-1</sup>. While Fig. 1 accentuates the level of Fall in Mean Arterial Pressure (FMAP) resulting from each treatment.

Table 2 shows that only the rats treated with 8 g kg<sup>-1</sup> of extract died whereas lower dosage did not confer mortality. From Table 3, except for the MXD count of group 4, there were no significant differences (at 95% confidence level) in hematological parameters of the variously treated surviving rats.

Idu *et al.* (2006b) reported that aqueous extract of *Stachytarpheta jamaicensis* dose-dependently reduced MAP in rabbits from a basal level of 102.8±4.2 mm Hg to 96.6±7.3 and 74.7±8.7 mm Hg by doses of 2.5 and 20 mg kg<sup>-1</sup>, respectively. Equivalent doses of methanol extract of *B. axillaris* reduced rabbit's MAP from a basal level of 115.67±3.6 to 106.22±3.13 and 69.33±2.59,

Table 1: The effect of methanol extract of *B. axillaris* leaf on the mean arterial pressure of rabbit

Dose (mg kg <sup>-1</sup> )	MAP (mmHg)
0	115.67±3.60
2.5	106.22±3.13
5	97.11±2.05
10	87.22±2.90
20	69.33±2.59

Mean±SEM, MAP: Mean Arterial Pressure

Table 2: Lethal effect of various dosage of methanol extract of *B. axillaris* leaf on Wistar rats

Groups	Dose (g kg <sup>-1</sup> )	No. of death	Mortality (%)
1	Control	0 of 3	0
2	1	0 of 3	0
3	2	0 of 3	0
4	4	0 of 3	0
5	8	3 of 3	100

Control = Normal Saline

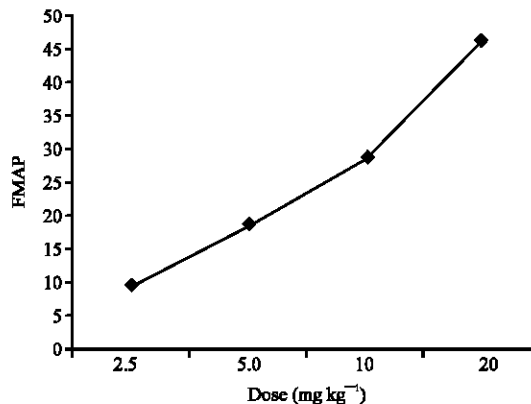


Fig. 1: Fall in MAP (FMAP) with methanol extract of *B. axillaris* leaf

**Table 3: Effect of methanol extract of *B. axillaris* leaf on some hematological parameters of wistar rats**

Groups	Dose (g kg <sup>-1</sup> )	WBC (μL <sup>-1</sup> )	RBC (μL <sup>-1</sup> )	PLT (μL <sup>-1</sup> )	HGB (g dL <sup>-1</sup> )	HCT (%)	LYM (%)	MXD (%)	NEUT (%)
1	Control	16.87±3.30 <sup>a</sup>	7.72±0.65 <sup>a</sup>	817.67±139.02 <sup>a</sup>	14.78±1.18 <sup>a</sup>	43.97±3.30 <sup>a</sup>	44.10±29.03 <sup>a</sup>	0.97±1.35 <sup>a</sup>	54.93±29.59 <sup>a</sup>
2	1	17.43±3.30 <sup>a</sup>	7.51±0.65 <sup>a</sup>	735.33±139.02 <sup>a</sup>	14.70±1.18 <sup>a</sup>	42.90±3.30 <sup>a</sup>	40.50±29.03 <sup>a</sup>	1.20±1.35 <sup>a</sup>	58.30±29.59 <sup>a</sup>
3	2	11.61±3.30 <sup>a</sup>	7.88±0.65 <sup>a</sup>	706.00±139.02 <sup>a</sup>	15.05±1.18 <sup>a</sup>	44.83±3.30 <sup>a</sup>	28.93±29.03 <sup>a</sup>	1.00±1.35 <sup>a</sup>	70.07±29.59 <sup>a</sup>
4	4	14.88±3.30 <sup>a</sup>	6.88±0.65 <sup>a</sup>	644.33±139.02 <sup>a</sup>	13.54±1.18 <sup>a</sup>	40.31±3.30 <sup>a</sup>	51.57±29.03 <sup>a</sup>	5.23±1.35 <sup>b</sup>	43.20±29.59 <sup>a</sup>

Means±SEM with similar superscript within a column are not significantly different  $p>0.05$ , Means±SEM with different superscripts within a column are significantly different  $p<0.05$ , WBC: White Blood Corpuscle, HGB: Hemoglobin, HCT: Hematocrit, RBC: Red Blood Corpuscle, PLT: Platelets, LYM: Lymphocyte, MXD: Eosinophyll and Basophyll, NEUT: Neutrophyll counts, Control: Normal saline

respectively (Table 1). Similarly, Ayinde and Amaechina (2005) reported FMAP values of 12.9±0.58, 26.6±1.8 and 34.43±0.59 mm Hg after administration of 2.5, 10 and 20 mg kg<sup>-1</sup> doses of aqueous extract of *B. axillaris*. However, the present study revealed similar doses of methanol extract resulted in (FMAP) of 9.44±1.54, 28.44±1.28 and 46.33±1.96 mm Hg, respectively (Fig. 1).

The prior administration of atropine or chlorpheniramine (antagonists) did not inhibit the hypotensive effect of the extract and there was no obvious effect on the heart rate. This suggests that the extract may not be acting through histamine release, but possibly through the stimulation of endothelia muscarinic receptors which can lead to the release of vaso-relaxant nitric oxide (Idu *et al.*, 2006b).

The observation of either hematological, behavioural, biochemical or histological changes have been employed in toxicological studies (Jaouhari *et al.*, 1999; Mutalik *et al.*, 2003; Basu and Arivukkarasu, 2006). The extracts of *Jatropha curcas* and *Phyllanthus amarus* leaves had drastic effects on some hematological parameters (Oluwole and Bolarinwa, 1997; Oyedapo, 2001).

The rats in this research showed high tolerance for the methanol extract of *B. axillaris* leaf (Table 2). A zero percent mortality was still recorded for a relatively high dose of 4 g kg<sup>-1</sup> and their agility appeared undisturbed. However, after about 30 min of 8 g kg<sup>-1</sup> dose administration, rats in this group went into episode of intense general muscular spasm and died shortly after. Hematological parameters were not significantly different ( $p>0.05$ ) except in the differential blood count (MXD) of group 3 (Table 3). Such an isolated observation could be considered to be of little or no toxicological significance (Moto *et al.*, 2004).

**CONCLUSION**

This study has further strengthened the ethnomedicinal claim as well as earlier report on the hypotensive property of *B. axillaris*. The activity of this extract in reducing systolic blood pressure may prove to be of significance in the prevention of hemorrhagic stroke, as this would mean a lowered force at which blood is

pumped out of the heart into the systemic circulation and thus the reduction of risk of rupture of tender blood vessels in the brain, which is a predisposing factor to stroke conditions in high blood pressure patients.

The therapeutic index of this plant is also impressive as the acute toxicity dosage is high. However, the efficacy as well as the chronic toxicity effect of the plant still requires further elucidation.

**REFERENCES**

Aibinu, I., 2006. Medicinal Plants as Antimicrobials. In: Outlines and Pictures of Medicinal Plants From Nigeria, Odugbemi, T. (Ed.). University of Lagos Press, pp: 53-64.

Amos, S., P.A. Akah, L. Binda, N.M. Enwerem, A. Ogundaini, C. Wambebe, I.M. Husaini and K.S. Gamaniel, 2003. Hypotensive activity of the ethanol extract of *Pavetta crassipes* leaves. Biol. Pharm. Bull., 26 (12): 1674-1680.

Ataman, J.E., M. Idu, E.A. Odia, E.K.I. Omogbai, F. Amaechina, A.O. Akhigbe and L.E. Ebite, 2006. Histopathologic effects of *Stachytarpheta jamaicensis* (L.) Vahl. On Wistar rats. Pak. J. Biol. Sci., 9 (3): 477-482.

Ayinde, B.A. and F.C. Amaechina, 2005. Hypotensive effect of *Baissea axillaris* (Apocynaceae) leaves in normotensive rabbits. J. Pharm. Bioresour., 2 (2): 20-24.

Basu, S.K. and R. Arivukkarasu, 2006. Acute toxicity and diuretic studies of *Rungia repens* aerial parts in rats. Fitoterapia, 77 (2): 83-85.

Curtis, D.K., 2001. Principles of Toxicology and Treatment of Poisoning. In: The Pharmacological Basis of Therapeutics, Good and Gilman (Eds.). 10th Edn. McGraw Hills, pp: 67-71.

Fabeku, O., 2006. Traditional Med: The Arts, Ways and Practice. In: Outlines and Pictures of Medicinal Plants from Nigeria, Odugbemi, T. (Ed.). University of Lagos Press, Nigeria, pp: 13-20.

Fabricant, D.S. and N.R. Farnsworth, 2001. The value of plants used in traditional medicine for drug discovery. Environ. Health Perspect., 1: 69-75.

- Idu, M., J.E. Ataman, A.O. Akhigbe, E.K.I. Omogbai, F. Amaechina and E.A. Odi, 2006a. Effect of *Stachytarpheta jamaicensis* (L.) Vahl. on Wistar rats: Serum biochemistry and ultrasonography. *J. Med. Sci.*, 6 (4): 646-649.
- Idu, M., E.K.I. Omogbai, F. Amaechina and J.E. Ataman, 2006b. Some cardiovascular effects of aqueous extract of the leaves of *Stachytarpheta jamaicensis* L. Vahl. *Int. J. Pharmacol.*, 2 (2): 163-165.
- Jaouhari, J.T., H.B. Lazrek and M. Jana, 1999. Acute toxicity of 10 Moroccan plants reported to be hypoglycemic agents. *Therapie*, 54 (6): 701-706.
- Kim, M., H.J. Lee, S. Wiryowidagdo and H.K. Kim, 2006. Antihypertensive effects of *Gynura procumbens* extracts in spontaneously hypertensive rats. *J. Med. Food*, 9 (4): 587-590.
- Lloyd-Jones, D.M., J.C. Evans, M.G. Larson, C.J. O'Donnell, E.J. Roccella and D. Levy, 2000. Differential control of systolic and diastolic blood pressure. Factors associated with lack of blood pressure control in the community. *Hypertension*, 36: 594-599.
- Mabadeje, A.F.B., 2002. National survey of hypertension and obesity in Nigeria. *World Hypertension League*, 1: 19-20.
- Moto, M., M. Okamura, T. Watanabe, Y. Kashida and K. Mitsumori, 2004. 13th week repeated dose toxicity of rice bran glycosphingolipid in Wistar Hannover (Galas) rats. *J. Toxicol. Sci.*, 29 (1): 73-80.
- Mutalik, S., B. Sulochana, M. Chetana, N. Udupa and D.P. Uma, 2003. Preliminary studies on acute and sub-acute toxicity of an anti-diabetic herbal preparation, Dianex. *Indian J. Exp. Biol.*, 41 (4): 316-320.
- Olatunji-Bello, I.I. and F.O. Awobajo, 2006. Methods of Investigating Physiological Actions of Medicinal Plants. In: *Outlines and Pictures of Medicinal Plants from Nigeria*, Odugbemi, T. (Ed.). University of Lagos Press, Nigeria, pp: 65-71.
- Oluwole, F.S. and A.F. Bolarinwa, 1997. *Jatropha curcas* causes anaemia in rats. *Phytother. Res.*, 11: 538-539.
- Oyedapo, O.O., 2001. Biological activities of *Phyllanthus amarus* extracts on Sprague Dawley Rats. *Nig. J. Biochem. Mol. Biol.*, 16: 83-86.
- Somchit, M.N., I. Reezal, E.I. Nur and A.R. Mutalib, 2003. *In vitro* antimicrobial activity of ethanol and water extract of *Cassia alata*. *J. Ethnopharmacol.*, 84: 1-4.
- Stepp, J.R. and D.E. Moerman, 2001. The importance of weeds in ethnopharmacology. *J. Ethnopharmacol.*, 75: 19-23.
- Takahashi, N. and O. Smithies, 2004. Human genetics, animal models and computer simulations for studying hypertension. *Trends Genet.*, 59: 347-379.
- Yesilada, E., 2005. Past and future contributions of traditional medicine in the health care system of the Middle-East. *J. Ethnopharmacol.*, 100: 135-137.