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## An investigation into the antipyretic activity of n-hexane extract of the leaves of *Baphia pubescens* Hook.F (family Leguminosae)

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### ABSTRACT

*Baphia pubescens* is claimed by the people of Ogidi in Idemili Local Government area of Anambra State, Nigeria to have anti pyretic, analgesic and antimicrobial properties. The decoction of the leaves is used to treat wounds, running stomach (diarrhea), aches and pains as well as fever locally. This investigation was carried out to ascertain the veracity of these claims.

The leaves of *Baphia pubescens* was collected and dried at ambient temperature and pulverized. Exactly 200 g of the powdered drug was extracted with 400 ml of n-hexane using the cold maceration technique for 24hours with occasional shaking. This was filtered and the procedure repeated with the marc. The combined filtrates were concentrated under reduced pressure with rotary evaporator. The preliminary phytochemical tests were carried out using standard methods. The antipyretic activity using brewer's yeast to induce pyrexia was conducted.

The leaves of *Baphia pubescens* exhibited antipyretic activity by lowering the temperature induced by brewer's yeast in rats. Alkaloids, flavonoids, saponins carbohydrates, carbohydrates were absent while steroids and tannins, were found.

Preliminary studies support the claim that the leaves of *Baphia pubescens* possess antipyretic properties.

**Keywords:** *Baphia pubescens*, marc, brewer's yeast, rotary evaporator.

### 1. Introduction

Herbal medicine practice plays an important role in the primary healthcare delivery system in most developing countries including Nigeria <sup>[1]</sup>. Even the World Health Organization (WHO, 2002) is actively encouraging national governments of member countries to utilize their traditional systems of medicines with regulations suitable to their national health care systems. The WHO estimates that 80% of the population living in rural areas use or depend on herbal medicine for their health needs (WHO Traditional Medicine Strategy, 2002). However, in spite of the obvious and important contribution the herbal medicine makes to primary health care, it continues to be antagonised by majority of allopathic medical practitioners as it is considered to have no scientific basis <sup>[2]</sup>. This work is therefore a preliminary work to prove that there is scientific evidence to the use of leaves of *Baphia Pubescens* in the treatment of pyrexia.

One major problem of herbal medicine practice is that there is no official standard and / or local monograph <sup>[19]</sup>. In Nigeria, the Federal Government has urged the federating states to set up traditional medicine boards to license and regulate the practice of herbal practitioners under the supervision of ministries of health <sup>[1]</sup>.

Many medicines including reserpine, ergotamine, vincristine, and vinblastine are of herbal origin <sup>[2]</sup>. About one quarter of the present prescription drugs dispensed by community pharmacies in the United States contain at least one active principle originally derived from plant materials (Farms Worth and Moris, 1976). pharmaceutical

#### 1.1 *Baphia pubescens* as a medicinal plant

Taxon: *Baphia pubescens* Hook.F.

Genus: *Baphia*

Family: Leguminosae -papillonoideae

Tribe: Sophoreae

Synonym: *Baphia bancoensis* Aubrev

Common names:

English names: Benin camwood

Other names: Awewi, urohun, Maajigi

### 1.2 Description of the Plants

A tree about 20 ft. high, with trunk 20 cm in diameter the ultimate branches slender, terete, densely brown-silky. Petioles 3/8–1/2 in. long, slender, ferruginous; leaves oblong or narrow-obovate, 3–4 in. long, acuminate, the base cuneate or slightly rounded, subcoriaceous, under surface ferruginous on the veins when young. Pedicels 1–4 together from the main branches, 1/4 in. long, erecto-patent, ferruginous-downy. Bracteoles minute, rounded. Calyx 1/4 in. deep, finely ferruginous-downy. Corolla twice as long as the calyx, white; standard roundish, 1/2 in. broad. Pod straight, 3 in. long, 3/4 in. broad, membranous, rigid, glabrous, brown, polished, narrowed to both ends [34].



### 1.3 Geographical Distribution

Benin camwood (*Baphia pubescens* Hook.F) - It has a distribution similar to that of *Baphia nitida*, It's main geographical area is Africa found in countries including Nigeria, Zaire, Congo, Ivory Coast, Benin, Cameroon, Gabon, Ghana, Liberia [28].

Habitat: Guineo- Congolian forest; Guinea Congolia/Sudania

regional transition zone forest [26].

### 1.4 Medicinal Uses

The leaves or leaf juice are applied against parasitic skin diseases. A leaf infusion is drunk to cure enteritis and other gastrointestinal problems [5].

In Ghana, Côte d'Ivoire and Nigeria the leaves and bark are considered haemostatic and anti-inflammatory, and are used for healing sores and wounds [3].

In Côte d'Ivoire powdered leaves are taken with palm wine or food to cure venereal diseases, and leaf sap is applied as eye drops against jaundice [17].

An extract of young leaves with some salt and red pepper is used as nose drops against headache [23].

In Nigeria powdered heartwood is made into an ointment with shea butter (obtained from the seeds of *Vitellaria paradoxa* C.F.Gaertn.) which is applied against stiff and swollen joints, sprains and rheumatic complaints [21].

In Sierra Leone a bark decoction is drunk to cure cardiac pain and bark and leaves are prepared as an enema to treat constipation [18].

In Nigeria and Ghana the pounded dried root, mixed with water and oil, is applied to a ringworm-like fungus attack

In Côte d'Ivoire a leaf extract of camwood and *Senna occidentalis* (L.) Link is drunk against asthma.

In Benin a decoction of the leaves is taken against jaundice and diabetes; in combination with leaves of *Morinda lucida* Benth. It is a treatment against female sterility and painful menstruation.

In the leaves saponins, flavonoids, glycosides and true tannins are present. An ointment made from the leaves showed anti-inflammatory activity in mice. Extracts of fresh leaves inhibited digestion in mice and rats, and showed anti-diarrhea. Leaf extracts of *Baphia nitida* have also been found to show analgesic effect in mice (Thanga Krishna Kumari et al 2012)

### 1.5 Materials and Method

#### Drug, Chemicals and Solvents.

N-hexane, tween-80, Paracetamol, ibuprofen and Aspirin tablets, brewer's yeast.

#### 1.6 Materials

Test tubes, test tube rack, syringe and needle (1 ml, 2 ml, 3 ml), Electronic weighing balance (Gulfes Mediqaland scientific, England), measuring cylinder, conical flask, beakers (10 ml, 25 ml, 50 ml, 500 ml capacities) Miller (Thomas Laboratory Mill, UK), glass rod, hand gloves, rotary evaporator, Brewer's yeast,

#### 1.7 Collection and Identification

The fresh leaves of *Baphia pubescens* were obtained from Ogidi, Idemili North Local Government Area of Anambra State, Nigeria in December 2013, during the dry season and was identified by Mr Ozioko, a Taxonomist with the Biosource Development and Conservation program (BDCP) Nsukka, Enugu State, Nigeria. The leaves were air-dried for 2 weeks in the Pharmacognosy laboratory. They were milled and 500 g of the powdered plant material was obtained.

#### 1.8 Preparation of Ethanol Extract for Pharmacological Study

200 g of powdered plant sample was macerated in 400 mls of n-hexane, for 48 hours after which it was filtered with muslim

cloth and further filtered using Whatman (No 1) filter paper. The procedure was repeated with the marc. The combined filtrates were concentrated using rotary 45 °C.

#### Phytochemical Screening

The tests carried out were based on procedures outlined by <sup>[10]</sup> and Evans (1996).

#### 1.9 Tests for alkaloids

To 0.5 gm of the extract, 5.0 ml of 1% aqueous hydrochloric acid was added steamed on a steam bath and filtered. 1.0 ml of the filtrate was then treated with five drops of Mayer's reagent and a second 1.0 ml portion treated similarly with freshly prepared Dragendorff's and Wagner's reagents. Turbidity or precipitations with either of the reagents indicated the presence of alkaloids in the extract.

#### 1.10 Test for tannins

To 0.5 g of the extract, 20 ml of water was added, boiled and filtered and used for the following test

##### (a) Ferric chloride test

To 3 ml of the filtrate, 2 drops of ferric chloride was added. Formation of a greenish black precipitate indicated the presence of tannins.

##### (b) Lead acetate test

To 3 ml of the filtrate was added lead acetate solution. Formation of precipitate indicated the presence of tannins

#### 1.11 Test for saponins

To 1.0 gm of the plant extract, 5.0 ml of distilled water was added. The solution was shaken in a test tube and filtered. Frothing which persists on warming is a preliminary evidence for the presence of saponins. 10.0 ml of the filtrate was mixed with 5.0 ml of distilled water and shaken vigorously for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously then observed for the formation of emulsion which confirms the presence of saponins

#### 1.12 Test for proteins

To 0.5 g of the extract, 20 ml of distilled water was added, shaken and filtered and the filtrate was used for the following tests

##### (a) Millon's test

To a little portion of the filtrate in a test tube, two drops of millon's reagent was added. A white precipitate indicated the presence of proteins.

##### (b) Xanthoproteic test

5 ml of the filtrate was heated with few drops of concentrated nitric acid. A yellow colour which changed to orange on addition of an alkali (dilute sodium hydroxide) indicated the presence of protein.

#### 1.13 Test for flavonoids

10 ml of ethyl acetate was added to 0.2 g of the extract and heated on a water bath for 3 minutes. The mixture was cooled, filtered and the filtrate was used for the following tests

##### (a) Ammonium test

4 ml of the filtrate was shaken with 1ml of dilute ammonia

solution. The layers were allowed to separate. A yellow colour in the ammoniacal layer indicated the presence of flavonoids.

##### (b) 1% Aluminium chloride solution test

4 ml of the filtrate was shaken with 1 ml of 1% aluminium chloride solution and the layers were allowed to separate. The formation of yellow colour in the aluminium chloride layer indicated the presence of flavonoids

#### 1.14 Test for Steroids and Terpenoids

9 ml of ethanol was added to 1 g of the extract and refluxed for a few minutes and filtered. The filtrate was concentrated to 2.5 ml on a boiling water bath. 5 ml of hot water was added to the concentrated solution, the mixture was allowed to stand for 1 hour and the waxy matter was filtered off. The filtrate was extracted with 2.5 ml of chloroform using separating funnel.

To 0.5 ml of the chloroform extract in a test tube was carefully added 1 ml of concentrated sulphuric acid to form a lower layer. A reddish brown interface showed the presence of steroids.

Another 0.5 ml of the chloroform extract was evaporated to dryness on a water bath and heated with 3 ml of concentrated sulphuric acid for 10 minutes on a water bath. A grey colour indicates the presence of terpenoids.

#### 1.15 Test for Carbohydrates

##### Molisch test

To 0.1 g of the extract 2 ml of water was added, boiled, and filtered. To the filtrate, two drops of naphthol solution in ethanol (molisch reagent) was added. Concentrated sulphuric acid was gently poured down the side of the test tube to form a lower layer. A purple interfacial ring indicated the presence of carbohydrate.

##### Test for reducing sugars

0.1 g of the plant extract was shaken vigorously with 5 ml of distilled water and filtered. The filtrate was divided and used as follows

##### Fehling's test

To a 1ml portion of the filtrate was added equal volumes of fehing's solution I and II and boiled on a water bath for a few minutes. A brick red precipitate indicated the presence of reducing sugars.

##### Animals

White male albino rats (150-250 kg) obtained from the animal house of the Department of Pharmacology and Toxicology of Madonna university Elele Campus River state were used for this study. All the animals were housed under standard environmental conditions where they have free access to food and water.

#### 1.16 Antipyretic Activity

Brewer's yeast induced hyperpyrexia method:- twenty albino rats of either sexes were divided into four groups of five rats each. The normal body temperature of each rat was taken rectally at one hour interval for seven hours. The antipyretic activities of the extract were evaluated using the method described by Turner (1965). Hyperthermia was induced in all the four groups by subcutaneous injection of brewer's yeast (w/v) suspended in 0.5% (w/v) sodium chloride solution. After 18 h of yeast injection the vehicle (tween 80), standard drug (paracetamol 150 mg/kg) and the ethanol extract (100 mg/kg,

200 mg/kg and 400 mg/kg) were administered to different groups orally respectively. Rectal temperature was recorded using clinical thermometer at 0 hr, 2 hrs, 3 hrs, 4 hrs after drugs administration [29].

Statistical Analysis:-all procedures were carried out in triplicates and the results expressed as  $\pm$  standard error of

mean (SEM). Differences in observation were determined by analysis of variance (ANOVA) using Dunnette analysis method

## 2. Results

### Phytochemical result

Constituents	Relative appearance
Saponins	-
Tannins	+
Carbohydrates	-
Protein	-
Flavonoids	-
Reducing sugar	-
Alkaloids	-
Steroids	++

### Antipyretic Activity Result of N-Hexane Extract

Dose	Pre induction of fever	Post induction of fever	1 hr	2 hrs	3 hrs	4 hrs
100 mk/kg	37.10 $\pm$ 0.03	39.60 $\pm$ 0.03	39.40 $\pm$ 0.03	39.16 $\pm$ 0.02	38.90 $\pm$ 0.03	38.20 $\pm$ 0.01
200 mg/kg	37.10 $\pm$ 0.02	39.90 $\pm$ 0.02	39.00 $\pm$ 0.00	39.00 $\pm$ 0.00	39.00 $\pm$ 0.00	38.00 $\pm$ 0.05
400 mg/kg	37.10 $\pm$ 0.02	39.80 $\pm$ 0.02	38.17 $\pm$ 0.06	37.80 $\pm$ 0.02	37.80 $\pm$ 0.00	37.80 $\pm$ 0.02
Control	36.60 $\pm$ 0.33	39.43 $\pm$ 0.07	39.50 $\pm$ 0.07	39.50 $\pm$ 0.07	39.50 $\pm$ 0.07	39.50 $\pm$ 0.03
Standard	37.33 $\pm$ 0.03	39.70 $\pm$ 0.05	38.70 $\pm$ 0.1	38.20 $\pm$ 0.03	37.20 $\pm$ 0.07	36.5 $\pm$ 0.25

## 3. Discussion

Many reviews and articles reporting the biological activities of flavonoids [24, 14], anthraquinones, polyphenols and phenols, and tannins [30], have been published in recent years. Several phenol compounds have been identified and isolated from plants and they have shown promising bacterial inhibiting properties against specific and broad spectrum of cultured as well as clinical bacterial strains including Methicillin-Resistant *Staphylococcus aureus* (MRSA), and multi-drug resistant bacteria. The presence of alkaloids has been shown to demonstrate biological activity [6].

Alkaloids, phenols, flavonoids and glycosides have a number of biological activities and strong antibacterial potentials (Robbers *et al.*, 1996). Alkaloids have exhibited promising activity against *H. pylori* [7] and a number of other bacterial strains [25, 15, 16]. The Result of phytochemical screening showed abundance of steroids and moderate amount of tannins but absence of carbohydrates, alkaloids, saponins, flavonoids, proteins and reducing sugars in the n-hexane extract of *Baphia pubescens*. Pyrexia was reduced and the most effective dose was 400 mg/kg of the extract. The reduction in pyrexia is dose dependent. Increasing the dose, increases the effectiveness of the agent. Though the temperature did not crash, but there is slight reduction in temperature. It is evident therefore that n-hexane extract of *Baphia pubescens* leaves has significant anti-pyretic activity.

## 4. Conclusion

The n-hexane leaves extract of *Baphia pubescens* exhibited anti pyretic activity, hence its use by the local community in Ogidi of Anambra State, Nigeria as anti-pyretic drug.

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