Phytochemical Properties and Ethnobotanical Potentials of *Thonningia sanguinea* (Vahl) for the Management/Cure of some Common Ailments

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Abstract

The ethno-botanical potentials of *Thonningia sanguinea were investigated through its phytochemical screening*. The specific objectives wereto provide adequate information that will serve as a basis for scientific research and to sensitize the populace on the usefulness of this plant especially in the management and cure of asthma. The phytochemical screening of both airdried and sundried samples revealed the presence of alkaloids, saponin, phenol, glycosides, tannin, terpenes and phlobotannin, while anthraquinones, cardenolides, flavonoid and chalcones were completely absent. Also, sundried samples showed higher quantitative values than air dried samples in the quantitative determination of the phytochemicals. This study revealed the potentials of this plant in the formulation of alternative therapy for the treatment of asthma wound and blood treatment. It could serve as antioxidant, anticancer, antimicrobial, analgestic, antispasmodic, bactericidal, cytotoxicity and salmonellosis. It therefore provides detailed empirical information regarding the phytochemistry of *T. sanguinea* for local medicine practitioners as well as for local people using this herb for a variety of body disorders.

Keywords:*Thonningia sanguinea;* Ethnobotany; Phytochemical Screening

Introduction

The use of medicinal plants as alternative therapeutic agent worldwide cannot be overemphasized. Herbaceous plants have a wide range of biological, health care and diseases protection activities such as pharmacological, anti-bacterial and anti-fungal activities (Okwu*et al*., 2003).Medicinal plants are of great importance to the health of individuals and communities(Edeoga*et al*, 2005).

The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds (Durai*et al*, 2016).Keeping in view the importance of phyto-chemicals, vitamins and other important constituents of medicinal plants and their wide use by local communities and practitioners for a variety of ailments, it is very vital to examine their active constituents and to provide scientific base-line information which a significant role in knowing the quantities of these phytochemicals.

Asthma is a disease affecting the airways to and from human lungs. People who suffer from this chronic condition (long-lasting or recurrent) are said to be asthmatic. The inside walls of an asthmatic's airways are swollen or inflamed. This swelling or inflammation makes the airways extremely sensitive to irritations and increases susceptibility to allergic reaction. -Modern medicine has labeled it as an incurable illness. However, good treatment and management will ensure that an individual suffering from this condition lives a normal and active life. The prevalence of asthma has increased significantly since the 1970s. As of 2011, 235–300 million people were affected globally(WHO, 2011) including about 250,000 deaths(Global Initiative for Asthma, 2011).Medications used to treat asthma are divided into two general classes: quick-relief medications used to treat acute symptoms; and long-term control medications used to prevent further exacerbation.

Thonningia sanguinea is an obligate parasite of trees and perennial woody plants such as *Musanga cecropioides*; *Hevea brasiliences*, (rubber), *Phoenix*

dactylifera (date), and *Theobroma cacao* (cocoa) (Jigam*et al*., 2012). This plant is used in some parts of Africa for herbal medicine. Its various names in some West African countries and uses in traditional medicine are presented in Tables 1 and 2 respectively.

Table 1: Traditional name of *Thonningia sanguinea* in some parts of Africa

s/no	Traditional name	Reference
Ghana		
1	**Adangme-Krobo:** (i) ablɛfotã (Bunting, ex FRI)(ii) kpadei (Bunting)	Burkill, 1985
2	**Akan-Asante:**kwabɛdwea = infertile forest oil-palm (FRI)	
3	**Nzema:**adzilɛananse = ground pineapple (FRI; JMD)	
4	**Twi:** (i)ananse-abedwaa (Bunting) (ii)kwabɛdwea (iii)bɛ: oil-palm (iv) dwea: = infertile forest oil-palm (FRI)	
Cote d'voire		
1	**Abure:**bétianbitibe (B&D)	Burkill, 1985
2	**Akan-brong:**sassiabéréké (K&B)	
3	**Anyi:**buroabéle = pineapple of the bush (K&B)	
4`	**Guere:** *(Chiehn)*niéssagiué (B&D)	
5	**Kru-guere:**gruhain (K&B) grukoma (K&B)	
6	**Kulango:**nabianihorongo (K&B)	
7	**Kyama:**duatuigui (B&D)	
Nigeria		
1	**Edo:**èdín-égũi (JMD; Lowe) èdín-òtọ̀ (JRA; JMD)	Burkill, 1985
2	**Hausa:**kubla (JMD) kúllaá (JMD; ZOG)	
3	**Igala:** obi atu = duiker's kolanut (Boston)	
4	**Igbo**: *(Owerri)*akankwanza (JMD)	
5	**Yoruba:**adélẹ̀, adé-ilẹ̀ = crown of the ground (JMD; Verger) óóyá-ilẹ̀ = comb of the ground (JMD; Millen), eyin-ile(Ikale_yoruba)	
Sierraleone		
	Loko:ngororugu (NWT)	Burkill, 1985
Togo		
	Tem: *(Tshaudjo)*tshitshing (Gaisser)	Burkill, 1985

Source: Authors survey, 2013

Table 2: Plant parts and local uses of *Thonningiasanguinea*

s/no	Plant part	Local use	Reference
1	Flower	Medicines: leprosy; paralysis, epilepsy, convulsions, spasm	Burkill, 1985
2	Flower-head	Medicines: anus, haemorrhoids; diarrhoea, dysentery; dropsy, swellings, oedema, gout; genital stimulants/depressants	
3	Rhizome	Food: sauces, condiments, spices, flavourings	
4	Rhizome flower-head	Medicines: vermifuges	
5	Sap	Medicines: skeletal structure	
6	Whole plant is pounded	astringent; it is thought to be an aphrodisiac in Nigeria	

7	Rhizome and flowers, without the red bracts	ointment for application to skin-diseases in Ghana the	
8	Whole plant is prepared as a plaster	maturate abscesses, crushed and diluted in water as a mouth-wash for dental caries, gingivitis and mouth-infections, and sap is given to a suckling infant with fever as an embrocation applied to the infant's body	
9	Whole plant	used in medicine in Nigeria for dysentery	
10	The extracts of flowers	used in traditional medicine in Ivory Coast to treat diarrhea diseases including salmonellosis	N'guessan et al, 2007

Materials and Methods

Plant materials

The plant samples were collected from forest floor of *Musangacecropioides*plant at Sakponba Forest Reserve, Orhiowon L.G.A., Edo State, Nigeria.

Preparation of plant materials

The collected plant was uprooted with the aid of a matchet washed using tap water and then rinsed in distilled water. Some of the plants were spread for drying at room temperature for eight weeks until they were completely dried, while the remaining were sundried for two weeks. Thereafter, both samples were pulverised into fine powder using home blender and sieved with 3.0mm sieve size.

Phytochemical screening

Chemical tests were carried out on the powdered specimensusing standard procedure to identify the constituents as described by Sofowora (1993), Trease and Evans (1989) and Harbone (1973).

Alkaloids: 1ml of each powder was stirred with 5ml of 1% aqueous HCL on a steam bath and filtered while hot. Distilled water was added to the residue and 1ml of the filtrate was treated with a few drops of either Mayer's reagent (Potassium mercuric iodide-solution). The formation of a cream colour gives a positive test for alkaloids.

Saponin: About 5ml of eachpowder was boiled in 20ml of distilled water in a water bath and filtered. 10ml of the filtrate was mixed with 5ml 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 a positive presence of Saponin.

Phenol: 5ml of each powder was pipetted into a 30ml test tube, then 10ml of distilled water was added. 2ml of ammonium hydroxide solution and 5 ml of concentrated amyl alcohol were also added and left to react for 30min. Development of bluish green colour was taken as a positive presence of phenol.

Taninns: 1ml of each powder was boiled in 20ml of water in a test tube and then filtered. A few drops of 0.1% ferric chloride was added and blue–black coloration was observed which confirmed the presence of tannin.

Glycosides (Keller – Killani test): Five ml of each powder was treated with 2ml of glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with 1ml of concentrated sulphuric acid. A violet-green ring appearing below the brown ring, in the acetic acid layer, indicates the positive presence of glycoside.

Phlobatannins: Deposition of a red precipitate when 2ml of each powder of each plant samples was boiled with 1% aqueous hydrochloric acid was taken as evidence for the presence of phlobatannins.

Steroids: 2ml of acetic anhydride was added to 2ml powder of each sample followed by careful addition of 2ml H_2SO_4. The colour changed from violet to blue or green indicated the presence of steroids.

Terpenoids (Salkowski test): Five ml of each powder was mixed with 2ml of chloroform, and 3ml

concentrated H_2SO_4 was carefully added to form a layer. A reddish brown coloration of the interface was formed to show positive results for the presence of terpenoids.

Quantitative determinations

The quantitative determination of chemicals present in this species in appreciable quantity was carried out using appropriate standards.

Alkaloid determination using Harborne (1973) method: 5 g of the sample was weighed into a 250 ml beaker and 200 ml of 10% acetic acid in ethanol was added and covered and allowed to stand for 4 hours. This was filtered and the extract was concentrated on a waterbath to one-quarter of the original volume. Concentrated ammonium hydroxide was added dropwise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitate was collected and washed with dilute ammonium hydroxide and then filtered. The residue alkaloid was dried and weighed.

Saponin determination using spectrophotometric method of Brunner (1984): 1g of finely ground sample was weighed into a 250ml beaker and 100ml of isobutyl alcohol was added. The mixture was shaken on a UDY shaker for 5 hours to ensure uniform mixing. Thereafter the mixture was filtered through a Whatman No1 filter paper into a 100ml beaker and 20ml of 40% saturated solution of magnesium carbonate was added. The mixture obtained with saturated $MgCO_3$ was again filtered through a Whatman No1 filter paper to obtain a clear colourless solution. 1ml of the colourless solution was pipetted into 50ml volumetric flask and 2ml of 5% $FeCL_3$ solution was added and made up to mark with distilled water. It was allowed to stand for 30min for blood red colour to develop. 0-10ppm standard Saponin solutions were prepared from saponin stock solution. The standard solutions were treated similarly with 2ml of 5% $FeCL_3$ solution as done for 1ml sample above. The absorbance of the sample as well as standard saponin solutions were read after colour development in a Jenway V6300 Spectrophotometer at a wavelength of 380nm.

$$\%Saponin = \frac{Absorbance\ of\ sample\ x\ gradient\ factor\ x\ dilution\ factor}{Wt.of\ sample\ x\ 10{,}000}$$

Determination of total phenols by spectrophotometric method: The fat free sample was boiled with 50 ml of ether for the extraction of the phenolic component for 15 min. 5 ml of the extract was pipetted into a 50 ml flask, then 10 ml of distilled water was added. 2 ml of ammonium hydroxide solution and 5 ml of concentrated amylalcohol were also added. The samples were made up to mark and left to react for 30 min for colour development. This was measured at 505 nm.

Results and discussion

The results of phytoscreening and phytoquantitative of airdriedand sundried samples of *Thonningiasanguinea*are shown in tables.Alkaloids, Saponin and Phenol were observed in higher quantities: Alkaloids(0.386/0.413)%,

Saponins(0.528/0.567)%,
Phenol(0.086/0.097)%;Tannin and Glycosides were observed in moderate quantities; Phlobatannin,Steroids and Terpenes were observed in minute/trace amount; while Anthraquinones,Cardenolides, Flavonoids and Chalcones were completely absent. From the phytochemical results, the following are the various uses of the plant:

- Wound healing and bleeding treatment. Saponins have properties of precipitating and coagulating red blood cells and they also have cholesterol binding properties, formation of foams in aqueous solutions and haemolytic activity (Sodipo*et al*., 2000).
- Antioxidant, anticancer and antimicrobial properties as a result of Phenolic compounds especially tannins (El-Sayed*et al*., 2012).
- Use in the treatment of cough, asthma and hay fever as a result of tannins and alkaloids (Burkill, 1985; Gill, 1992;Edeoga*et al*.,2005).
- Use as analgesic, antispasmodic and bactericidal activities as a result of alkaloids and their derivatives (Antherden, 1969;Okwu and Okwu, 2004). It can also be used for cytotoxicity (Nobori*et al*., 1994).

- Alternative solution for the treatment of salmonellosis particularly in Ivory Coast where this pathology is always a public health problem (N'guessan*et al.*, 2007 and Ouattara, 2005).

Table 3: Result of phyto screening of *Thonningia sanguinea*

Sample	**Air dried**	**Sundried**	
Parameters	**Value**	**Value**	**Remark**
Alkaloids	+++	+++	Present in an appreciable amount
Saponin	+++	+++	Present in an appreciable amount
Phenol	+++	+++	Present in an appreciable amount
Glycosides	++	++	Present in moderate amount
Tannin	++	++	Present in a moderate amount
Phlobatannin	+	+	Present in a minute or trace amount
Steroids	+	+	Present in a minute amount
Terpenes	+	+	Present in a minute amount
Flavonoid	-	-	Completely absent
Anthraquinones	-	-	Completely absent
Cardenolides	-	-	Completely absent
Chalcones	-	-	Completely absent

Table 4: Result of Phyto-quantitative of *Thonningia sanguinea*

Sample	**Air Dried**	**Sundried**
Parameters	**Value**	**Value**
Alkaloids	0.386	0.413
Saponin	0.528	0.567
Phenol	0.086	0.097

Conclusion

The results revealed the presence of medicinally important constituents in the plant *Thonningiasanguinea*and several studies carried out by numerous authors are supportive of this view. Therefore, the plant *Thonningiasanguinea*, could be seen as a good source of bioactive chemical compounds which can be of great value. It is suggested that further work should be carried out to isolate, purify, and characterize the active constituents responsible for the activity of the plant.

Recommendation

The herb's development should be promoted and its sustainable utilization as an alternative to chemical-based option encouraged.

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