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Phyto-Constituents of Two Medicinal Plant Species Used as Aphrodisiacs in Ghana

Y. AMEYAW*, V.Y.A. BARKU† and FATAWU BASHIRU†
Science Education Department, University of Education, Winneba, Ghana
E-mail: y61ameyaw@yahoo.com

Two aphrodisiac plant species; *Mondia whitei* and *Hallea stipulosa* originally called *Mitragyna stipulosa* were collected from Begoro in the Fanteakwa District in the Eastern Region of Ghana for the research. The dried stem-barks of the two plant species were extracted with methanol and ethanol. The extracts (crude drugs) were screened for alkaloids, steroids, tannins, coumarins and reducing sugars. With the exception of tannins, the other four compounds were positively present in the plant species.

Key Words: *Mondia whitei, Hallea stipulosa, Mitragyna stipulosa*.

INTRODUCTION

One of the intimate relationship's between man and plants is using the latter as aphrodisiacs to enhance the former's sexual drive. Aphrodisiacs are substances which are ingested, topically applied, smoked, snorted or otherwise delivered into an individual's system to aid in achieving high performance. A significant number of plant species, minerals and synthetic compounds have been classified as being aphrodisiac.

The biological significance of aphrodisiacs can be classified into three forms as nutritional, physiological and psycho-pharmacological aphrodisiacs. It is known that proper nutrition and an appropriate balance diet can promote a general health and well-being in individuals. This will actually result in an increase in energy and in the long run enhance sexual activity as a component. For example, in China the application of the rhinoceros horn as an aphrodisiac might have resulted from the nutritional potential of the horn at the time. The actual fact is that the rhino horn resembles an erect penis and also consists of fibrous tissue with calcium and phosphorus elements as major constituents. Deficiencies in these elements may result in muscle weakness as well as general fatigue, which are always required to boost an individual's sexual drive.

A wide range of physiological active aphrodisiacs such as the “Pseudo Spanish Fly, Jungle Love Tablets, Pseudo Energizers and the Original Vice-Spice” contain primarily red pepper (*Capsicum*) and ‘Pseudo Hard-On Drops’ containing roots of

†Department of Chemistry, School of Physical Sciences, University of Cape Coast, Cape Coast, Ghana.

licorice, ginseng, niacin and paprika were extensively marketed in the 1970s as sexual boosters.

Mondia whitei belongs to the family Periploaceae, a shrub grown in the wild in Africa and other parts of the world. The roots contain zinc, iron and calcium, which are essential minerals as well as vitamin K, A, D and E which are also antioxidant vitamins. The roots also contain isovanillin, a food flavouring agent. It has enormous nutritional value and ongoing studies show that it may be effective against many diseases.

The roots are chewed or used in alcoholic beverages as an aphrodisiac. Though this claim is disputed, it remains the most popular application of the root. It is however, believed to be a stimulant. Its constituent, 2-hydroxy-4-methoxybenzaldehyde is a potent inhibitor of tyrosinase activity and is claimed to make the skin lighter, smooth and shiny when ingested. It could potentially be used in cosmetic formulations as topical application.

It is also used as dietary supplement and in pharmaceutical preparation for the prevention of browning. In Malawi, the roots are also used for the treatment of headaches, diarrhea, stomach upsets and gonorrhea. Its leaves can be boiled and the fusion taken to stop vomiting. Mondia can be used as a tea. It has a sweet vanilla-like flavour. It can also be used as spice since it has a slightly peppery taste.

Ecology and botany of the plant species: *M. whitei* grows up to 3-6 m and it is a vigorous climber, attractive heart-shaped leaves. It is a woody climber with the leaves arranged equidistantly along the vine. The roots are slightly tuberous in form, sweet and have a characteristic flavour (Fig. 2). The roots are bristle and light in weight when dry. It is cream in colour. Dry roots are normally 1 to 2 cm in diameter.

The leaves are petiolate, broadly oblong, ovate, obovate or almost rotund, shortly acuminate, rounded to deeply cordate at the base, up to about 17 cm. The flowers are pale greenish-white or cream and the fruits are bi-lobed (Fig. 1).

Fig. 1. *M. whitei* with bi-fruits

Fig. 2. A stem stock of the plant showing a long succulent root

Geographical distribution: *M. whitei* is very common in the Sudano-Guinean region. It is widely distributed in the tropical Africa. In Ghana, the plant occurs as undergrowth in cocoa farms, often found climbing the cocoa trees. They may also be found in forest clearings where cassava is cultivated. *M. whitei* has been recorded in some communities such as Pepease, Suhum, Asesewa, Apeguso (Eastern region); Kumawu, Kumasi, Nyinahin (Ashanti region); Bomaa, Wawasua-Nsuatre (Brong-Ahafo Region) and Buem Nsuta and Kadjebi (Volta Region). It is also found in sandy loam soils and in between rocks. At Kwahu Pepease for example, the climber forms a significant cover of the vegetation. It is one of the few plants that are able to sprout after bushfires.

Propagation: Its propagation is by seed and root cuttings. Anytime some of the roots are left in the soil during harvesting, they sprout into new shoots.

Pharmacological and toxicological properties: The acute studies of the aqueous extract of *M. whitei* roots on testosterone production and fertility of male rats, wister rats have been carried out. In that treatment the serum and testicular concentrations of testosterone remained unchanged. During a chronic treatment for 8 d, a significant increase in the testicular weight, the serum and testicular testosterone, the testicular protein content and the sperm density at a $p < 0.05$-0.01 occurred. This proved that *M. whitei* possesses androgenic property.

Hallea stipulosa originally called *Mitragyna stipulosa* is a medicinal plant species which belongs to the family Rubiaceae and is found to be related to the *Corynanthe*, *Cinchona* and *Uncaria* genera and shares some similar biochemistry. It is in the same family as coffee and the psychoactive plant *Psychotria viridis*. Other species in the *Hallea* genus are used medicinally in Africa and also used for their wood.

The plant species is used for its psychoactive effects in its native region, with some use elsewhere in the world. In Southeast Asia the fresh leaves are usually chewed, often continuously, by workers or manual labourers seeking a numbing, stimulating effect. Elsewhere, the leaves are often made into a tea or extracted into water and then evaporated into a tar that can be swallowed.

Pharmacological and toxicological properties: *Hallea stipulosa* pharmacologically act as a mu-opioid receptor agonist. It also shares some adrenergic receptor activity similar to that of yohimbine. The plant also play a beneficial role on the immune system and lower blood pressure, as well as, a powerful antioxidant also found in dark chocolate and closely related to the Epigallocatechin gallate (EGCG) that gives green tea its beneficial effects. Other active chemicals in the plant species include raubasine obtained from *Rauwolfia serpentina* and some yohimbe alkaloids such as corynantheidine[1,2].

Medicinally the plant has many potential uses, for example as a low grade analgesic comparable to codeine or propoxyphene, as an alternative to methadone and as a source of other chemicals with a wide range of beneficial activities which could be isolated from the psychoactive constituents[3].

Ecology and botany of the plant species: *Hallea stipulosa* is an evergreen tree. It usually grows to a height of 12-15 ft tall and 15 ft wide. Depending on the species and location it can grow up to 40-50 feet tall. And in some cases has been known to reach near 100 ft.

The leaves of the tree are a dark green colour and can grow over 7 inches long and 4 inches wide. The flowers are yellow and grow in clusters.

The tree does well in wet, humus soil, medium to full sun exposure and an area protected from strong winds. This research is aimed at assessing the phyto-chemical constituents of *Mondia whitei* and *Hallea stipulosa* using two different extractive media-methanol and petroleum-ether.

EXPERIMENTAL

The stem bark of *M. whitei* and *H. stipulosa* were collected from Begoro in the Fanteakwa District in the Eastern Region. The fresh samples were dried in a solar dryer at the Centre for Scientific Research into Plant Medicine, Mampong-Akuapem. The dried samples were prepared and the plant materials were air-dried for 30 d and pulverized into powder using the Manesty disintegrator. 70 g each of the powdered material were extracted with 100 mL each of methanol and petroleum-ether. The contents were mounted on the electronic shaker and shook for 3 d at a rate of 6 h per day. Contents occasionally heated up to 30 ºC and temperature maintained.

Phytochemical screening: Phyto-chemical screening was carried out to look for the presence of alkaloids, saponins, steroids/terpenoids, tannins, reducing sugars and coumarins using the methanol and petroleum ether extracts obtained from the two plant samples.

Test for alkaloids: To 1 mL of the test solution, 3 drops of draggendorff's reagent was added and resultant reddish-brown precipitate shows the presence of alkaloids. The test was repeated using Wagner's and Mayer's reagents and again, the formation of brown and yellow precipitates proved the presence of alkaloids.

Test for steroids

Liebermann-Burchard's test: 10 mL each of the extract was evaporated to dryness. The resulting residue was dissolved successively in 0.5 mL acetic anhydride and 0.5 mL chloroform solutions were transferred to a dried test tube and a concentrated sulphuric acid introduced to the bottom using a pipette.

Test for tannins: 0.5 mL of extract was diluted with 1 mL of distilled water with the addition of 2 drops of 3 % ferric chloride solution. The occurrence of blackish-blue colour indicated the presence of gallic tannins and a greenish-black indicated the presence of catechol tannins.

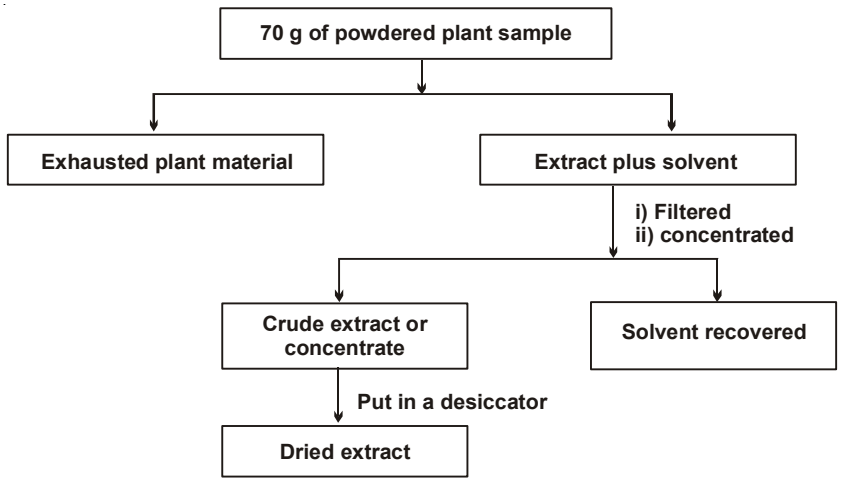
Test for coumarins: 5 mL of the extract was evaporated to dryness. Resulting residue dissolved by heating in 2 mL of distilled water. Aqueous solution divided into two equal volumes in two test tubes. To one of the test tubes 0.5 mL of 10 % ammonia solution was added and the other tube as reference. The occurrence of intense fluorescence under UV indicated the presence of coumarins.

Test for reducing compounds: 1 mL of the extract was diluted with 2 mL of distilled water. 1 mL of each Fehling's solution were mixed in a test tube and added to the aqueous solution of the extract. The mixture was heated and the occurrence of brick-red precipitate proved the presence of reducing sugars.

Test for saponins

The froth test: A small amount of the powdered samples were shaken with 2 mL distilled water in a test tube of 6 mm diameter. Persistent froth formation for more than 15 min suggested the presence of saponins.

A flow chart-I showing the extraction procedure[4,5].



Flow chart-I

A summary of a flow chart-II for screening the powdered dried samples[4,5].

RESULTS AND DISCUSSION

The results presented in Table-1 is a representation of the type of test conducted, observations made and inferences of the constituents present using methanol and petroleum-ether extracts.

The screening test for the plant species, *M. whitei* and *H. stipulosa* using methanol and petroleum-ether as extractive media proved the presence of alkaloids, steroids, coumarins and reducing sugars.

The presence of alkaloids and steroids in both medicinal plant species prove a reason for their common aphrodisiac property. It has been established that many known aphrodisiac medicinal plant species contain alkaloids. This is confirmed by the presence of yohimbine, an alkaloid obtained from the yohibehe plant which has a very high aphrodisiac properties.

TABLE-1

Constituent	Test	Observation	Inference
Methanol extract using *Mondia whitei*			
Alkaloids	Dragendorff's test	Reddish-brown precipitate	Present
	Mayer's test	Yellowish-white precipitate	
	Wagner's test	Brown precipitate	
Steroids	Liebermann-Burchards reaction	Reddish-brown ring at the interface with chloroform layer being violet	Present
Tannins	1mL of extract+2mL distilled H_2O+3 drops of 3%$FeCl_3$	Yellowish-brown solution	Absent
Coumarins	0.5mL of 10%NH_3 solution+2mL of test solution	A yellowish-green fluorescence under UV light	Present
Reducing sugars	1mL of dilute extract+Felhing's solution A & B	Brick red precipitate	Present
Froth test for saponins using plant raw materials of *M. whitei*			
Saponins	2mL of distilled H_2O + small amount of powdered sample in test tube + shake	No formation of froth	Absent
Petroleum-ether extract of *M. whitei*			
Alkaloids	Dragendorff's test	Reddish-brown precipitate	Present
	Mayer's test	Yellowish-white precipitate	
	Wagner's test	Brown precipitate	
Steroids	Liebermann-Burchards reaction	Reddish-brown ring at the interface with chloroform layer being violet	Present
Tannins	1mL of extract+2mL distilled H_2O+3 drops of 3%$FeCl_3$	Yellowish-brown solution	Absent
Coumarins	0.5mL of 10%NH_3 solution+2mL of test solution	A yellowish-green fluorescence under UV light	Present
Reducing sugars	1mL of dilute extract+Felhing's solution A & B	Brick red precipitate	Present

Yield/Percentage yield of crude extracts

Methanol extracts

Plant sample	Mass obtained (g)	Yield (%)
M. whitei	4.20	6.000
H. stipulosa	3.55	5.071

Constituent	Test	Observation	Inference
	Methanol extract of *Hallea stipulosa*		
Alkaloids	Dragendorff's test	Reddish-brown precipitate	Present
	Mayer's test	Yellowish-white precipitate	
	Wagner's test	Brown precipitate	
Steroids	Liebermann-Burchards reaction	Reddish-brown ring at the interface with chloroform layer being violet	Present
Tannins	1mL of extract+2mL distilledH_2O+3 drops of 3%$FeCl_3$	Yellowish-brown solution	Absent
Coumarins	0.5mL of 10%NH_3 solution+2mL of test solution	A yellowish-green fluorescence under UV light	Present
Reducing sugars	1mL of dilute extract+Felhing's solution A & B	Brick red precipitate	Present
	Froth test for saponins using plant raw materials of *H. stipulosa*		
Saponins	2mL of distilled H_2O + small amount of powdered sample in test tube + shake	Froth formed & persisted for more than 15 minutes	Absent
	Petroleum-ether extract of *H. stipulosa*		
Alkaloids	Dragendorff's test	Reddish-brown precipitate	Present
	Mayer's test	Yellowish-white precipitate	
	Wagner's test	Brown precipitate	
Steroids	Liebermann-Burchards reaction	Reddish-brown ring at the interface with chloroform layer being violet	Present
Tannins	1mL of extract+2mL distilledH_2O+3 drops of 3%$FeCl_3$	Yellowish-brown solution	Absent
Coumarins	0.5mL of 10%NH_3 solution+2mL of test solution	A yellowish-green fluorescence under UV light	Present
Reducing sugars	1mL of dilute extract+Felhing's solution A & B	Brick red precipitate	Present

Yield/Percentage yield of crude extracts

Petroleum-ether extracts

Plant sample	Mass obtained (g)	Yield (%)
M. whitei	3.43	4.900
H. stipulosa	3.22	4.600

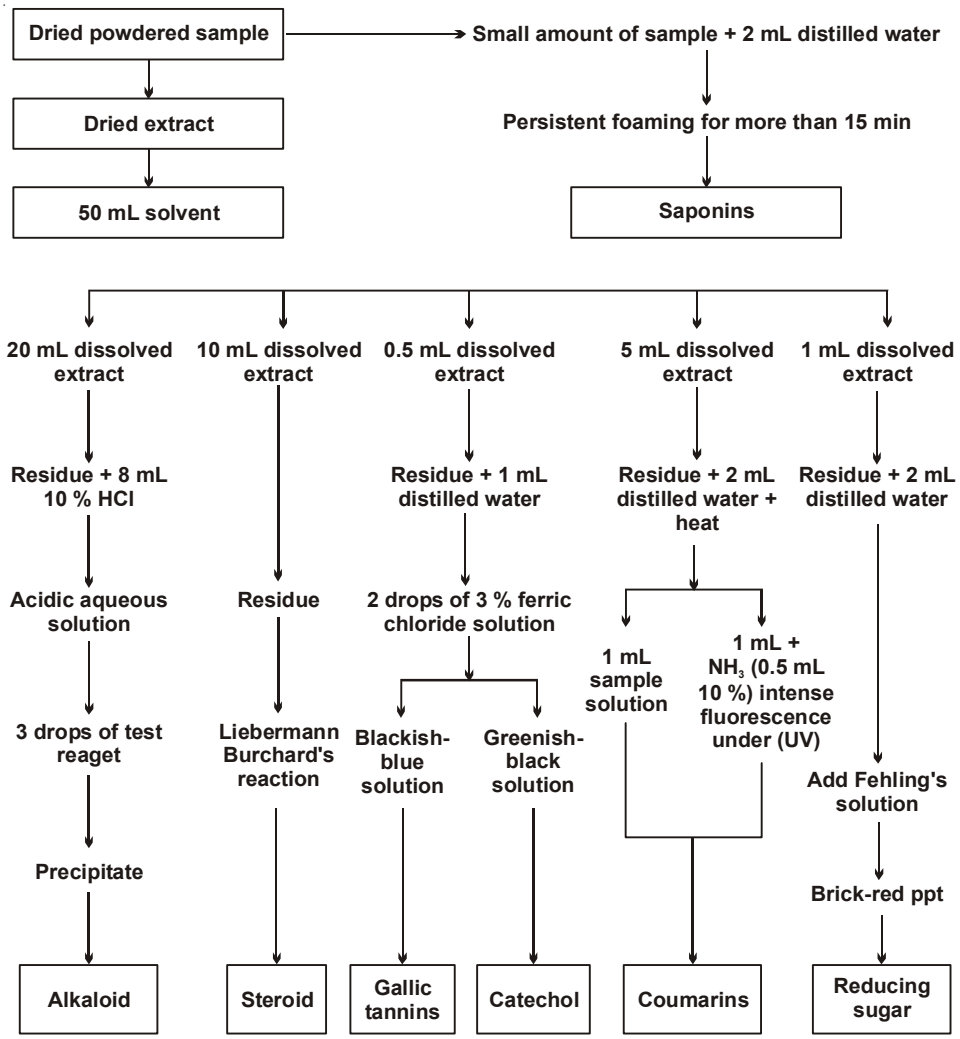


Chart-II

It must be noted that plant alkaloids like scopolamine and atropine are examples of parasympatholysis. These chemicals by blocking the muscarinic acetylcholine receptor hinder the activity of the parasympathetic system resulting in sedative and anesthetic effects. The application of products of these plants directly on the penis and other genital areas especially those with mucous membrane leads to a general tingling and anesthetization of the area resulting in premature ejaculation and increasing the duration of sexual activity.

Again, steroids are related to the sex hormones. Thus, the sexual hormones of both male and female are steroids, which are androgens and estrogens, respectively. Synthetic or natural steroids when injected, promote muscle growth and the development

of male sexual characteristics. Steroids have been found to help in the promotion of testosterone in the development of the reproductive characteristics and therefore, enhancing sexual performance[6,7].

Conclusion

The plant species studied were noted to contain alkaloids and different types of steroids as well as other chemical constituents. Alkaloids, steroids, coumarins and reducing sugars were recorded in *M. whitei* whiles in *H. stipulosa*, alkaloids, steroids, tannins (gallic tannins for methanol extract and catechol tannins was observed for the petroleum-ether extract). From the foregone, we can attribute the common aphrodisiac property of the two plant species to the presence of alkaloids and steroids.

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