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Chemicals Detected in Plants Used For Folk Medicine in South Eastern Nigeria

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ABSTRACT

Plant species used for folk medicine from diverse families of angiosperms employed by people in south eastern Nigeria were analysed for the basic chemical compounds that make them medicinal. It was observed that flavonols and Phenolic compounds were widespread in these plants. However, the types and amounts of these chemicals varied for even species in the same family.

INTRODUCTION

Medicinal plant species are so regarded because they are sources of well known and medically useful secondary products as wide-ranging as pain killers like morphine, stimulants like nicotine, caffeine, cocaine and depressants with high potency in the management of ailments in humans. Generally, drug plants are unique in containing compounds that are end-products of long biosynthetic pathways and are usually not needed in such plants' metabolic processes. Davis and Heywood (1963) reported that these compounds called secondary metabolites include: alkaloids, glycosides, essential oils and other organic constituents.

These constituents are usually produced in different parts of the plants like the root, leaves, fruits and seeds and then translocated to other parts of plant for storage (Kochhar, 1981). Knowledge about these medicinally active constituents makes their application in therapy

possible as contained in the various pharmacopoeias. Recently, in the field of ethno medicine it has been discovered that therapeutic efficacy was more pronounced when the active compound was left in a particular combination with other principles naturally present in plant than when it was isolated and synthesized in the laboratory. In our first work on medicinal plants, we made a check list of plant species with medicinal value in the south eastern parts of Nigeria (Obute, 2005); this is a follow up attempt at determining the types of flavonoids and amounts of phenolic compounds present in these plant species. Perhaps it is this discriminating occurrence that makes the various species efficacious in the treatment of different ailments even if they belong to the same family.

Flavonoids

Flavonoids are 15-carbon compounds which occur naturally and are widely distributed in the plant kingdom appearing in flower, fruits, stems, leaves, roots and plant derived beverages such as tea and wine. These are ubiquitous in occurrence in nearly all plants; the ease with which they are isolated and identified even from small amounts of plant materials as well make this chemical the most used for medicinal purposes. Flavonoids protect plants against external pathogens, ultra-violet light or heat. The most important class of flavonoids include: anthocyanides flavones, flavonoids, flavanones, flavan-3-01(also known as catechins). Anthocyanins and coloured compounds in flowers, they facilitate pollination by attracting insect and aid dispersal of seed in coloured fruits. The red, purple and blue colours of most flowers and red colour of most fruits and autumn leaves are due to anthocyanins, some yellow flowers tend to be due to carotenoids. The anthocyanins are concentrated in the vacuoles, not in the plastids as carotenoids are. Chemically anthocyanins are B-glycosides of anthocyanins.

Flavonoids possess anti-inflammatory properties and act as modulators of the immune system in number of biological systems. This stems from the fact that they are powerful antioxidants protecting biosystems against damaging effects of free radicals. Most flavonoids belong to a group of chemicals, called polyphenols, and

their antioxidant properties are dependent on this polyphenolic chemical structure.

Phenols

Phenols are characterized by the presence of the hydroxyl group (-OH) and is derived from hydrocarbons (aromatic hydrocarbon}. The reactivity of phenols is predominantly determined by the presence of the hydroxyl group.

Phenols are generally referred to by their common names but may also be named as benzene derivatives. Common examples of phenols include the following: resorcinol, hydroquinone o-cresol, m-cresol, most of the phenols are noted for their germicidal properties and cresol is used widely as a wood preservative. Plants produce many thousands of compounds which contain one or more phenolic residues, these compounds can be divided into major groups, according to the number of carbon atom in their skeleton. The current effort is targeted at listing the types of flavonoids and amounts of phenolic products present in plant species already known to be medicinal but not yet exploited by bioprospecting interests.

MATERIALS AND METHODS

The leaves used for this study were obtained from different plant species growing in their natural habitats. These plants as listed in Table 1, are, according to Obute (2005) used in the ethno medicine of the peoples of the south eastern parts of Nigeria. Plant collection was done from the premises of university of Port Harcourt and Eagle Island and its environs close to Rivers State University of Science and Technology in Port Harcourt Nigeria.

Table 1: Species Used In the Study

S/ N	Name of species used in medicine	Family
1	<i>Persea americana</i> Mil.	Lauraceae

3	<i>Newbouldia laevis</i> (P. Beauv) Seeman Ex Bureau	Bignoniaceae
4	<i>Phyllanthus amarus</i> Schum and Thonn	Euphorbiaceae
5	<i>Costus lucanusianus</i> L.	Costaceae
6	<i>Chromoleana odorata</i> (L) K R	Asteraceae
7	<i>Ageratum conyzoides</i> L.	Asteraceae
14	<i>Vernonia amygdalina</i> Del.	Asteraceae
2	<i>Aspilia africana</i> (Pers) C.D. Adams	Asteraceae
8	<i>Carica papaya</i> L	Caricaceae
9	<i>Anacardium occidentale</i> L.	Anacardiaceae
10	<i>Psidium guajava</i> L.	Myrtaceae
11	<i>Telfairia occidentalis</i> Hook. fil.	Cucurbitaceae
12	<i>Mangifera Indica</i> L	Anacardiaceae

13	<i>Caesalpinia pulcherima</i> (L) SW.	Caesalpinaceae
15	<i>Cymbopogon citratus</i> (DC) Staps.	Poaceae
16	<i>Avicennia germinans</i> L.	Avicenniaceae (Verbenaceae)
17	<i>Rhizophora racemosa</i> G. F. W. Meyer	Rhizophoraceae
18	<i>Rhizophora mangle</i> L.	Rhizophoraceae
19	<i>Nypa fruticans</i> (Wumb).	Arecaceae (Palmae)
20	<i>Senna alata</i> L. Syn. <i>Cassia alata</i> , <i>Herpetica alata</i>	Fabaceae

Flavonoid compounds

Leaf parts obtained from the species were crushed separately and immersed in different glass vials containing absolute ethanol solution (5mls). The mixtures were left for two days to ensure adequate extraction. The samples were subjected to separation protocols using the 2-D paper chromatographic method. A drop of each solution was collected with a capillary tube and spotted on a designated area on the chromatographic paper. A series of solvents Butanol-acetic acid and water in the ratio of 4:1:5; Forestal (Conc. HCl-acetic acid and water) in the ratio of 30:3:10 and 60:6:20ml and 50% acetic acid were used to carry out the analysis.

Each solvent was poured into a trough in the chromatographic tank one at a time. The end of the chromatographic paper nearest to the sample spots was folded appropriately, dipped into the trough at the top of the chromatographic tank and the rest of the paper made to hang vertically. Separation of samples occurred as the solvent front was obtained then the chromatographic paper was removed and hung to dry. Ammonia solution was used to spray the sheets and the setup was left to air dry for about 15 minutes and observed under the UV light to see colours produced.

Finally, the RF values for all the chromatographic papers were calculated by measuring the distance from the origin to centre of the circle of the colour observed under UV light divided by the distance between the origin and the solvents front (i.e. the distance the solvent travelled) multiplied by 100.

$$RF = \frac{\text{Distance migrated by analyte (Da)}}{\text{Distance migrated by the solvent (Ds)}} \times \frac{100}{1}$$

To determine the flavonoids which may be present in the species, the RF value of each specimen and their colours in the UV light were used according to the Harborne (1973) method.

Phenolic compounds

The leaf samples were crushed with mortar and pestle and 0.1g of each sample was poured into a conical flask and 20ml of distilled water was added and the set up was left to stand for about 10mins (for appropriate extraction) and then filtered into different conical flasks. 2.5ml of the filtrate was measured into another conical flask and 5ml of 0.1m NaOH was added. Then the set up was warmed in a hot plate to 65⁰ C. Then 2.5ml of iodine was added to each of the samples to obtain brown colouration of the samples. Then 0.5ml of Conc. HCL was added to the samples, after a drop or two of an indicator (starch solution) was added and to make the colour change to dark blue. The process was repeated using a blank (distilled water) titrated with Na₂S₂O₃ (sodium thiosulphate) until, it become colourless. To determine the amount of phenolic compounds present in the

specimen, the method of King and Armstrong (1934) was used and the formula below was used for the computation:

Phenol mg/h = (Blank - sample) x 1.567 x 4 x10 from other calculation the concentration of phenolic compound.

RESULTS

It was observed that most of the species contain flavonols and phenols. The type and amount of these varied with the species (Tables 2 a&b). It did not follow any particular phylogenetic pattern as members of the same family had different types of flavonols while those from dissimilar ones had the same types. The pattern of distribution of phenolic compounds also shows that there is no particular order (Table 2b) whereas some had up to 4.76mg/g as in *Anarcadium occidentale* most showed 1.76mg/g as the least amount.

Table 2 a: Chemical Compounds Detected in the species

S/ N	Na me of pla nts	Fa mil y	Flav onoi d Prese nt
1	<i>Per sea am eric ana Mil</i>	La ura cea e	Myri cetin (Flav onols)
2	<i>Asp ilia afri can a</i>	Ast era cea e	Goss ypeti n

	(Per s) C. D. Ad ams		(Flav onols)
3	<i>Ne wb oul dia lae vis</i> (P. Bea ux) See ma n E.X . Bureau	Big non iac eae	Quer cetin (Flav onols)
4	<i>Phy llan thus am aru s</i> Sch um & Tho nn	Eu pho rbi ace ae	Kaya flavo ne (Bifla vonyl) Chry soeri ol (Flav

			onols)
5	<i>Cos tus luc anu sia nus L</i>	Co sta cea e	Myri cetin (Flav onols)
6	<i>Chr om ole ana odo rota (L) K. R</i>	Ast era cea e	Isorh amne tin (Flav onols)
7	<i>Age rat um con yzio des L</i>	Ast era cea e	Luteo lin (Flav ones)
8	<i>Car ica pap aya L.</i>	Car ica cea e	Kae mpfe rol

			(Flavonols)
9	<i>Anacardium occidentale</i> L	Anacardiaceae	Keampferol (Flavonols)
10	<i>Psidium guajava</i> L	Myrtaceae	Kayaflavone (Biflavonols)
11	<i>Telfairia occidentalis</i> Hooker .F.	Cucurbitaceae	Isorhomnetin (Flavone)
12	<i>Mangifera</i>	Anacardiaceae	Quercetin

	<i>era indi ca L</i>	adi ace ae	n (Flav onols)
1 3	<i>Cae sal pini a pul che rri ma (L) Sw</i>	Ca esal pini ace ae	Azale atin (Flav onols)
1 4	<i>Ver non ia am ygd alin a</i>	Ast era cea e	Myri cetin (Flav onols)
1 5	Le mo n gras s (Dc)	Poa cea e	Azale atin (Flav

	Sta ps		onols)
1 6	<i>Rhi zop hor a ma ngl e</i>	Rhi zop hor ace ae	Goss ypeti n (Flav onols)
1 7	<i>Rhi zop hor a rac em osa G.F .W Ma yer</i>	Rhi zop hor ace ae	Quer eceti n (Flav onols)

Table 2 b. The amounts of phenolic compounds found in each plant.

S/ N	Plant species	Amount of phenolic product
1	<i>Newbouldia laevis</i>	1.76mg/g
2	<i>Anacardium occidentale</i>	4.76 mg/g
3	<i>Chromoleana odorota</i>	3.51mg/g
4	<i>Ageratum conyzoides</i>	1.76mg/g

5	<i>Carica papaya</i> 2.51mg/g
6	<i>Persea americana</i> 3.01mg/g
7	<i>Telfairia occidentalis</i> 2.5mg/g
8	<i>Aspilia africana</i> 1.76mg/g
9	<i>Psidium guajava</i> 3.51mg/g
10	<i>Phyllanthus amarus</i> 3.51mg/g
11	<i>Vernonia amygdalina</i> 3.01mg/g

Results of the separation process of the chemicals are as shown in the chromatograms in Figure 1.

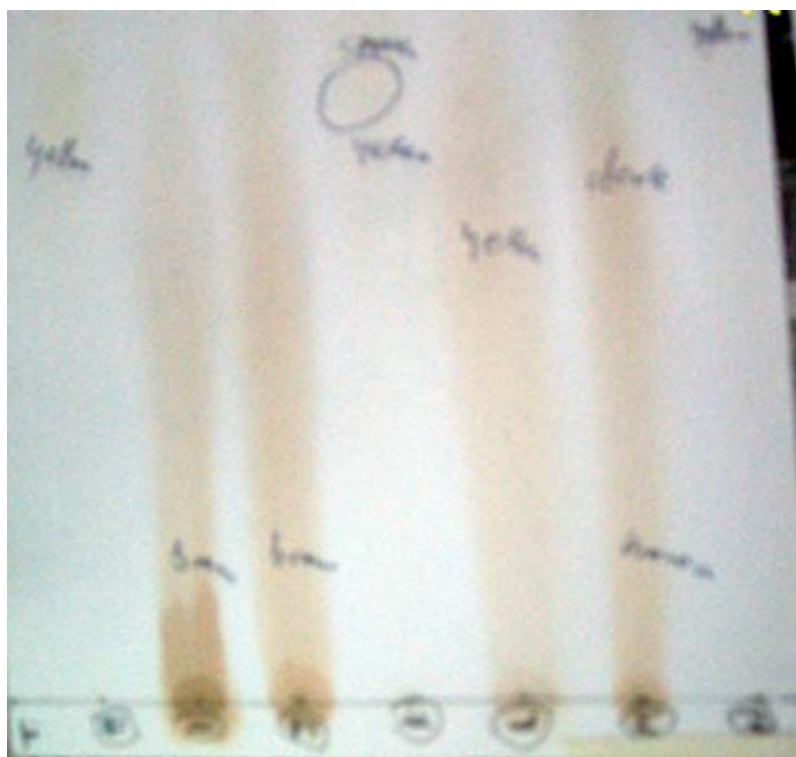


Fig. 1: Chromatograms of the separation process. Notice the separate positions of the separating chemicals in the field showing their different mobility and consequently their different molecular weights.

DISCUSSION

The results obtained in this study show that Isorhamnetic, Kaempferol, Luteolin, Myricetin, Quercetin are present in different plant species used for medicinal purposes. These plants are here textually and pictorially described for easy identification. It was observed that the type of flavonol recorded for the different species varied (Table 2a) and this probably explains their use for treating different ailments.

1. *Ageratum conyzoides* L.; Common Name: Billy-goat weed.

Family: *Asteraceae*

Plant Description

Ageratum conyzoides is an erect, herbaceous annual, 30-80cm tall; stems are covered with fine white hairs, leaves are opposite, pubescent with long petioles and include glandular trichomes. The inflorescence contains 30-50 pink flower arranged as corymbs and self-incompatible (Thansi, 1987). The seeds are positively photoblastic and viability is often lost within 12 months. (Laeire *et al*, 1987). The optimum germination temperature ranges from 20-25⁰C (Koch, 1988). The species has great morphological variation and appears highly adaptable to different ecological conditions.

Chemical Composition: *Luteolin* (*Flavonol*)

Part Used: Leaves

Medicinal Uses: Treatment of foamy eye and other eye disease.

- Decoction of the plant cures fever.
- The leaves should be chewed generously and swallowed as an antidote.
- The whole plant is styptic (Stopping bleeding). The leaf juice is poured into the wound and the bruised leaf left on it.



Plate 1. *Ageratum conyzoides* L.

2. *Phyllanthus amarus* (Schumach & Thonn); Common Names:
Gulf leaf flower, child pick-a-back/egg woman.

Family: *Euphorbiaceae*

Plant Description

Phyllanthus amarus is a common annual weed that grows up to 1 ½ feet high. The stem is erect, slender and profusely branched. It is brownish at the base but green at middle to upper parts. The leaves are small simple, numerous, green, oblong and feathery. The leaves have clear visible veins below and when picked, they fold in completely as in touch –me-not-plant. The name *Phyllanthus* reflects the unique arrangement of the flower on the leaves. The flowers are minute, solitary borne in the leaf axis. The fruits consist of small dehiscent 3-celled capsule. Seeds are wedge-shaped.

Part Used: Leaves

Medicinal Uses: Stooling (dysentery) Treatment

- Crushed leaves are applied on skin with ring worm, scabies and ulcer to treat same.
- Leaf extracts by 50% ethanol have been shown to have extensive antibacterial, antifungal and antiviral action (Oliver-Bever, 1986)
- Leaf extract of this herb with that of *Solenostemon monostachyus* taken twice daily for two weeks relieves one of arthritis.



Plate 2. *Phyllanthus amarus* (Schumach & Thonn)

3. *Caesalpinia pulcherrima* (L) SW. Common name: Pride-of-Barbados

Family: Fabaceae

Description

This is a scrambling shrub with closely prickly branches and slender branchlets; leaves bipinnate, pinnae 4-7 pairs, rachis prickly; leaflets oblong-elliptic mucronate 2.5-4.5 long, 1.5-2.5 cm broad, slightly pubescent flowers particulate, bracts linear, soon falling off, axis and calyx tomentose;

petals 5, oblong, yellow, subequal about 1cm long; stamen 10, free filaments villous toward the base, trust oblong elliptic, flattish 6-7cm long, 4cm broad,

very prickly with slender erect prickles 1-2 seeded, seeds spherical, lead-colour, smooth about 1.5 diameter.

Chemical Composition: azaleatin (flavonol)



Plate 3. *Caesalpinia pulcherrima* (L) SW.

Part used: Leaves

Medicinal uses: Treatment of menstrual pain in women.

The leaf extract is drunk as an emetic during treatment of asthma.

4. *Persea americana* Mil.

Family: Lauraceae **Common Name:** Avocado Pear, English Pear

Description:

This is a tree of about 28 ft (8-9m) high with a trunk diameter of up to 12-14 inches. The stem has a rough grayish bark.

Leaves are evergreen, alternate, entire, cumnate, net venated, simple and coriaceous. The fruit type is pome, having an outer thickened layer, a middle fleshy layer and a central core.

Chemical composition: *myricetin (flavonol)*

Part used: Leaves.

Medicinal uses. Used to treat dizziness and fainting resulting from excessive blood loss.



Plate 4: *Persea americana* Mil.

5. *Costus lucanusianus* L.; **Common Name:** Monkey's Sugarcane

Family: *Zingiberaceae*

Description

The perennial herb leaves are distichous, sheathing having a distinct equal and parallel venation. Flowers are arranged in dense heads borne at the end of flowering shoots.

Chemical Constituent: (*Myricetin*)

Part Used: Leaves

Medicinal Uses: This is used in the treatment of menstrual pains, by using infusion prepared from the leaves.



Plate 5. *Costus lucanuscianus* L.

6. *Newbouldia laevis* (BEAR) SEEMAN; Common names:

Boundary tree, Chieftaincy tree

Family Name: *Bignoniaceae*

Description A very tall reaching a height of 18m. Bark is grayish to pale brown and fairly smooth. Leaves are imparipinnately compound and opposite flowers purplish-pink having dark stripes closely crowded to form a cyme.

Chemical Composition: Quercetin (Flavonol)

Part Used: Leaves

Medicinal Uses: Used in the treatment of eye problems.

- The leaf juice is applied on wound (Oliver-Bever, 1986)



Plate 6. *Newbouldia laevis* (BEAR) SEEMAN

7. *Telfairia occidentalis* HOOK, F. Common name: fluted pumpkin

Family: *Cucurbitaceae*

Plant Description This is a dioecious perennial climber attaining up to 1000ft in length. Leaves, pedately 3-5 foliolate. Leaflets shortly stalked. Tendrils branched. Fruit, pale green containing seed embedded in an orange coloured pulp.

Chemical Composition: Isorhamnetin (Biflavonyl)

Part used: Leaves

Medicinal uses:

1. Leaf extract pure or mixed with eggs, is drunk to treat Anaemia. Pumpkin leaves and those garden eggs squeezed and drunk for seven days also eradicate Anaemia.
2. The infusion of the leaves is given as blood tonic to help convalescents. The leave infusion can also help in the treatment of malaria, loss of appetite.



Plate 7. *Telfairia occidentalis* HOOK, F.

8. *Chromolaena odorata* (L) R.M. King & H. Robinson; Common names: Awolowo's Plant, Siam Weed, Independence Weed.

Family: *Asteraceae*

Chemical Composition: Isorhamnetin

Plant description

A herb usually growing as an invasive plant. Leaves are simple, opposite and dentate flowers are whitish

Part used: Leaves.

Medicinal uses:

- I. Leaf juice taken internally or as enema treats malaria.
- II. The leaves are exceptionally styptic.
- III. The leaves and roots are steeped in our local gin for some hours. The intoxicating effect of the gin is reduced while infusion is taken to treat malaria, jaundice, fever and general pains.
- IV. Treat fresh cut to stop bleeding.



Plate 8. *Chromolaena odorata* (L) R.M. KING & H. ROBINSON

9. *Rhizophora racemosa* G. F. W. Mey

Family: *Rhizophoraceae*

Plant Description:

This is a shrub of up to 4-10m in height. It is common in the red mangrove in West Africa and occurs close to the shore line. It is reputed to be the colouring spp out of the 3 spp of the West Africa.

This species hybridize *Rhizophora mangle* to give rise to *Rhizophora harrisoni*. Therefore *R. harrisoni* is hybrid. The buds are obtuse at their radicles could attain on length of about 30-65 cm while still on the tree. The inflorescence is much branched and several to many flowers, the pinnacle is about 1.5-4 cm long flower are usually crowded, the midrib is reddish when fresh, leaves are blunt pointed at their apexes.

Chemical Composition: *gossypetin (flavonol)*

Part used: Leaves.

Medicinal uses:

- I. The bark when oiled yields a red dye used to polish wooden floors.
- II. The bark contains 22-33% tannin used to produce hard leather.



Plate 9. *Rhizophora racemosa* .G. F .W Meyer

10. *Rhizophora mangle* L. Common Names: Red mangrove, mangrove rojoo

Family Name: *Rhizophoraceae*

Plant Description

This is a shrub or small tree up to 5 m in height, occurring in mangrove swamps. Pedicels are about 6-15 cm in length and are relatively slender. The flower buds are acute at the apices. Sepals are about 10-13 mm long. The radicles seldom exceed 20 cm while still on the tree. Leaves are elliptic in shape, bud sub-acute at the base but obtuse at their apices. The pedicle is about 1-2 cm long.

Part used: Leaves

Medicinal Uses:

-Pulp is made from mangrove and used in manufacturing wrapping paper and allied products.

-The bark when boiled yields a red used to polish wooden floors.

-Astringent can be used as tonic.



Plate 10. *Rhizophora mangle* L.

11. *Avicennia germinans* (L) Common Name: *Black Mangrove*

Family: *Avicenniaceae*

Plant Description

The flowers of members of the family *Avicenniaceae* are regular or radially symmetrical (actinomorphic) member of this genus are shrubs or small tree leaves are opposite (phyllotaxy), simple, entire, estipulate, inflorescence is symuse, terminal, condensed flowers are small, actinomorphic. The fruit is a broad spherical bivalve (seed pumpkin) one seeded capsule. The seed germinate in the fruit i.e. Viviparous member of this group are characterized by the possession of pneumatophore or breathing root (some time called area root). They are negatively geotropic and grow out of the water, used for aeration.

Part used: Leaves

Medicinal Uses:

- Used to remedy tumor in West Indies.
- Used as astringent, insect repellent, rudifacient and tonic.
- Used in treatment of diarrhea, dysentery, rheumatism, swellings, throat ailments, tumor and wounds and hemorrhages



Plate 11. *Avicennia germinans* (L)

12. *Mangifera indica* L; Common Name: Mango

Family: Anacardiaceae

Description

This is a tree whose branching pattern confers a dome-like shape. Bark is rough, the slash produces a slow brown exudates. Leaves are simple, alternates. Flowers are small and inconspicuous. Fruit is a large drupe (having a leathery epicarp, fleshy mesocarp and a stony core). The fruits are green when unripe and yellow/orange when ripe.

Chemical Composition: overarching (flavonol)

Part Used: Leaves

Medical Uses:

- I. Treatment for fever (typhoid), malaria (Decoction)
- II. Young leaves and shoot are eaten as vegetables in java and Philippines
(FAO 1988).
- III. Leaf juice or infusion is used as gargle and mouthwash to treat toothache, sore gums and sore throat
- IV. The leaf and bark form important components in anti malaria concoction and infusion



Plate 12. *Mangifera indica L.*

13. *Carica papaya L.*; Common Name: Pawpaw, papaya

Family: Caricaceae

Plant Description

A tree with softwood and milky juice leaves in a cluster at the top of the stem, palmately lobed with long petioles. The plant is mainly dioecious rarely monoecious fruit a pulpy berry, containing seeds with fleshy endosperm.

Chemical Composition: Kaempferol (flavonol)

Part Used: Leaves.

Medicinal Uses:

- i) Decoction (preparation) malaria fever.
- ii) Young leaves and tops are eaten as vegetable (mainly in Asia).
- iii) Leaf juice is styptic and vulnerary (especially for cuts, sores, wounds).
- iv) Leaves and seeds are antihelmintic and carminative.
- v) The leaves are used in washing clothes when soap is scarce (as in war years).
- vi) Leaves are used to wrap meat (especially tough ones) and kept overnight before cooking. The meat is rendered tender due to the effect of Papain present in the leaf.



Plate 13. *Carica papaya* L

14. *Vernonia amygdalina* DEL.

Family: *Asteraceae* **Common Name:** Bitter leaf

Plant Description: A shrub of 2-5m high, leaves are elliptic with characteristic bitter taste.

Chemical Composition: Active ingredient-Vernonioiside B, myricetin (flavonol)

Part Used: Leaves

Medicinal Uses:

- i) Bitter leaf is used in local medicine to cure fever, cough and as a laxative.
- ii) Leaf decoction is taken to treat pneumonia, increase breast milk in nursing mothers and to cure cough.
- iii) The leaf juice treats ring worm and other skin infections. When drunk, it treats diabetes.
- iv) Leaf extract is drunk to cure malaria, fever and intestinal complaints.
- v) The infusion of the leaf treats loss of appetite.



Plate 14. *Vernonia amygdalina* DEL.

15. *Senna alata* (L) ROXB

Family: Fabaceae **Common Name:** Candle bush

Plant Description: *Senna alata* is a small perennial shrub growing from 3 to 12 ft with a straight woody stem and clusters of flowers that resemble candles, which eventually turn into seed pods. The flowers are usually yellow, but can be white or pink. The cylindrical seed pods have a woody brown shell up to 24 inches long. The space between the seeds within the pods is filled with sweet pulp. The leaves are picked before or during flower, while the pods are picked when ripe in the fall. The leaves have a stronger action than the pods and are commonly used.

Chemical Composition: Quercetin flavonol



Plate 15. *Senna alata* (L.) Roxb.

16. *Nypa fruticans* WURMB; Common Name: Nypa palm

Family: Arecaceae

Introduction: The Nipah palm is among the few palms that grow well in the mangrove. It grows in soft mud, mainly where the water is calmer, but where there is regular inflow of fresh water and nutritious silt. They can be inland as far as the tide can deposit the palm's floating seeds. It can tolerate infrequent inundation, so long as the soil does not dry out for too long. It is the mangrove plant with the oldest known fossil, with pollen dated 70million years old. Compared to Coconut palm, the Nypa palm appears to lack a trunk with its leaves growing straight out of the ground. In fact, its trunk is horizontal and lies underground. The trunk branches and each branch end with a bunch of fronds. The base of the frond is air-filtered to help it stay upright. The fruits form into a large ball about the size and shape of a soccer ball, rising from the mud on a stick. When it ripens, the ball breaks away and breaks up into individual fruits. These float and may even germinate as they float.

Description: The Nipah palm fronds emerge from the ground and the palm appears trunk less. It grows 4-9m tall, leaves are large, up to 9m long, has a globular inflorescence of female flowers at the tip with a catkin-like red or yellow male flowers on the lower branches. Fruit

contain seeds, several compressed into a ball. The immature fruits are white translucent and hard jelly-like called “attaché”. They are a common ingredient in local deserts.

Chemical Composition:

Part Used: Leaves

Medicinal Uses:

- i) The leaves are used to make roofing mats, hats, caps and brooms.
- ii) The midribs of the leaflet are used to make toothpicks, fish-traps.
- iii) Good quality wine is tapped from the palm.
- iv) The leaves are used for thatching and for fishing poles.



Plate 16. *Nypa fruticans* WURMB

17. *Cymbopogon citratus* (DC) Stapf

Family: Poaceae **Common Name:** Lemon grass, camel’s hay, citronella, Cochin grass

Plant Description: As the name suggests, this herb is naturally scented with a delicate lemon fragrance. The greyish-green, multilayered stalk grows straight and tall, opening up in to long grass like blades. But unlike its name, lemon grass does grow like the grass in the field. Though the long grass blades have a lemon scent, the dense light green inner stalk, especially the lower inches, held the

strongest flavour which is why lemon grass is regularly sown with the blade already trimmed off. Lemon grass is very tough and fibrous – almost woody near the root. It is a perennial tuft grass with long sharp edge blades.

Chemical Composition: Azaleatin (flavonol)

Part Used: Leaves

- i) is a culinary herb
- ii) used to treat and flu's stomach cramps and indigestion,
- iii) flatulence and urinary dysfunctions, fatigue back pain and menstrual irregularity
- iv) Can be used in the treatment of diabetes
- v) Is considered a diuretic, tonic and stimulant
- vi) It promotes good digestion
- vii) It is a well known insect repellent and essential oil in the perfumery.



Plate 17. *Cymbopogon citratus* (DC) Stapf.

18. *Anacardium occidentale* L. **Common name:** cashew

Family: Anacardiaceae

Plant Description

Low spreading evergreen, green perennial up to 10-15m high, propagated by seeds (germination in 14-21 days) or cuttings; usually

branched near the base. The inflorescence is a panicle with few ramifications and hermaphrodite and male flowers. The fruit is a kidney shaped nut. It is attached to the end of the enlarged pedicel called the cashew apple. The juice is tart, highly polymorphic.

Two groups of cultivars: *americanum*, with large juice fruits, and *indicum* with short peduncle, mainly used for the nut

Chemical Composition: (Kaempferol) Flavonol

Part Used: Leaves

Medical Uses: The decoction of the bark and leaves is used against diarrhoea and abdominal pains, inflammation and diabetes.

Sodium anacardate destroys snake venoms as well as tetanus and diphtheria toxin. The leaves and bark are used as diuretic.



Plate 18: *Anacardium occidentale* L

19. *Psidium guajava* L **Common Name:** Guava

Family: Myrtaceae

Plant Description: this is a small tree that grows 6-25 ft high. Smooth flaking off in patches, white flowers pulp when ripe. Numerous small woody seeds, leaves are simply and often opposite.

Chemical Composition: Kayaflavone (Biflavonyl)

Part Used: Leaves



Plate 19. Psidium guajava L.

Medical Uses:

- i) Decoction of the leaves, bark increase ;blood in the body
- ii) The decoction remedy for diarrhoea and dysentery
- iii) Leaves are also used to treat malaria/fever
- iv) Leaves are used as poultices on wounds, ulcer and sores.
- v) The leaves boiled with lemon grass and drunk to treat cough/whooping cough..
- vi) Leaf infusion treats stomach disorders, pains, stomach ache, indigestion, heartburn and palpitations.
- vii) Leaves are rich in tannin and used in dyeing and tanning. Bark has 11-30% tannin.

20. *Aspilula africana* (PERS) C. D. ADAMS

Family: Asteraceae

Common Name: Haemorrhage Plant

Description: A perennial herb varying in height from 60cm to about 1.5m depending on rainfall and soil fertility. It reproduces from seeds. The leaves are opposite, ovate-lanceolate, 6-15cm long and 3-7cm wide; they are rounded at the base with petioles about 1cm long, hairy and with three prominent vein. The inflorescence consists, of solitary terminal flower head with hairy stalk about 4-10cm long. The flowers have showy yellow heads with several florets. The fruits are 4 angled achenes about 5mm long, bristly and minutely hairy.

Chemical Composition

Gossypetin (Flavonols) Part Used: Leaves Medical **Uses**

1. The decoction of leaves is used as tonic.
2. Use as diuretic
3. Leaf infusion is use in treating cough and related ailment in children
4. Leaf extracts as enemas to pregnant women to quicken and ease delivery
5. The leaves are used to clean/prepare snail for soup.
6. The leaf juice is used to stop bleeding of serious magnitude and to accelerate healing of cuts, sores and wounds. It is therefore styptic and vulnerary.

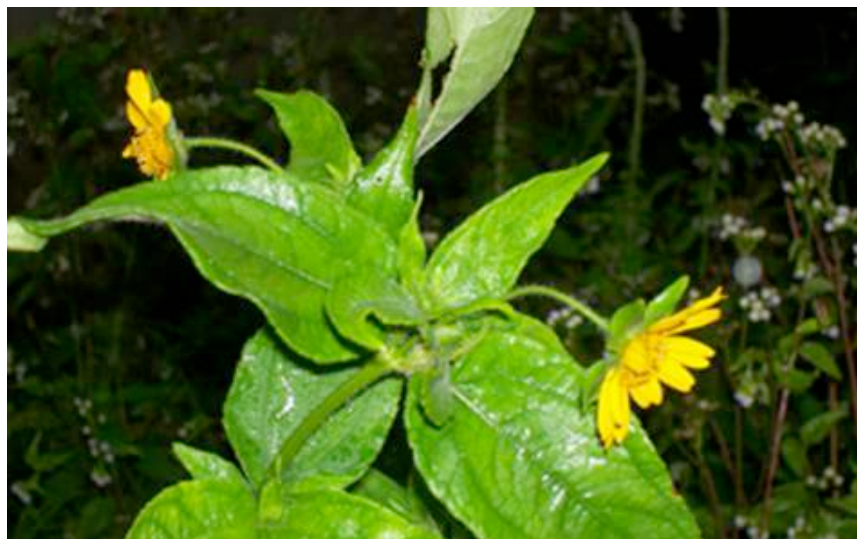


Plate 20. *Aspilia africana* (PERS) C. D. Adams

Conclusion

The chemical constituents and medicinal uses of some medicinal plants have progressively been aided greatly by the development of rapid and accurate methods for screening plant for a particular chemicals which the right proportion of healing substances, now it is known that many dozens (flavonoids) and (phenolic compounds) can occur in a single plant part (leaves). With this method, the surveys of plants for biologically active substances are very easy. The amount of (flavonoids) and (phenolic compound) vary from different plant species.

Chemotaxonomy characters like any others are useful at all level of taxonomic hierarchy and the level of their value cannot be easily predicted. It will undoubtedly be used with increasing frequency in the nearest future because of the chemicals extracted from plant part (leaves). i.e. (flavonoids) and (phenolic compounds) are found to be useful in the pharmaceutical and food industries. In the same countries they have been recorded to be used in the treatment of some ailments like diabetes, dysentery, diarrhoea, skin diseases, etc. These chemicals occur rarely in plants and are very useful in taxonomic purposes.

Finally, it is this variation in the chemical constituents in plants, that will make some more medicinal than others. It also improves the identification and classification of plant species. And note that no medicinal plant is functional without the active ingredients.

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