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LEAF AND ITS USE AS MEDICINE: A REVIEW

Mithun Mukherjee^{*1} and Sayan Biswas²

¹West Bengal State Council of Science and Technology, Bidhannagar, Kolkata-700064, West Bengal, India.

²School of Natural Product Studies, Jadavpur University, Kolkata-700032, West Bengal, India.

ABSTRACT

Medicinal plants have always been thought to be a healthy source of life for all people. Therapeutic properties of Medicinal Plants are very useful in curing various diseases and the onus of these medicinal plants is being 100% natural. Now day's people are practically forced to use thousands of unhealthy products, the level of sensibility in front of diseases is very high and that's why the use of medicinal plants can present the best option. Hence there is an increase of interest in natural plant based remedies also as a source of commercial product. This paper focuses on some leaves used in treating various dreadful and life threatening diseases namely Cancer, AIDS and Diabetes.

KEYWORDS

Leaves, Chemical Constituents, Medicinal Uses, Cancer, AIDS and Diabetes.

Author for Correspondence:

Mithun Mukherjee,
West Bengal State Council of Science and
Technology,
Bidhannagar, Kolkata-700064,
West Bengal, India.

Email: kainan@rediffmail.com

INTRODUCTION

Medicinal Plants have been used since time immemorial, and numerous cultures still rely on indigenous medicinal plants for their primary health care needs¹. It is easier to collect the leaves since less difficulty is encountered when compared to in the case of other positions of the plant. For not only is recognition easier, since specially in the herbs, these parts are usually gathered at a time when the plants are in flower, but the labor is less arduous, for there are no roots to dig or barks to peel. Leaves are usually collected when they have attained full development and may be obtained by cutting of the plant and stripping the leaves from the stem, using a scythe to mow the plants where they occur in sufficient abundance to warrant this or the leaves may be picked from the plants as they grow in the field. Stem should be discarded as much as possible

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and where a leaf is composed of several leaflets these are usually detached from the stem. In order that they may retain their bright green color and characteristic odor after drying, leaves and herbs must be carefully dried in the shade allowing the air to move freely but keeping out all moisture, dampness will darken them, and they must therefore be placed under cover at night or in rainy weather. A bright color is desirable as such a product will sell readily. To dry them the leaves should be spread out thinly on clean racks or shelves and turned frequently until thoroughly dried. They readily absorb moisture and when perfectly cured should be stored in a dry place. Leaves generally become brittle when they dry and must be carefully packed to cause as little crushing as possible. They should be firmly packed in gunny sacks or in dry clean boxes or barrels². The aim of this paper is to review some leaves and crude drugs containing leaves used in the treatment of dreadful and life threatening human diseases.

***Aloe ferox* (Asphodelaceae)**

Introduction

Aloe ferox Mill. Also known as Cape Aloe or bitter Aloe, is a One-stemmed, stout, *Aloe* reaching a height of around 10m. The broad succulent Leaves reach around 1m in length. "Ferox" meaning "ferocious" because of thorny, sharp red-brownish spines on the leaves³. Although *ferox* has an extensive availability in South Africa, it is largely concentrated along the eastern parts of the country⁴. The leaves are dry on the lower portion of the stem apart from being broad, leaves are fleshy, dull Green in color in the summer and reddish green in color in the winter and the arrangement is rosette type around the stem.

Chemical Constituents

Aloe ferox contains C-glycosides and resins. This is crystalline in nature and is known as aloin having not less than 70% of anhydrous barbaloin. It also has aloesin often called aloeresin B the first C-glycosylchromone. According to McCarthy and co-workers these anthroquinone derivatives are to be found in the leaf juices and aloin reaches a maximum concentration in the dried leaf juices in

the summer season and in the leaves they have the lowest concentration in the winter season⁵. Apart from this, it also has a large number of essential oils amongst which 1,3,6-octatriene is 23.87%, 2,4-decadien-1-ol,(E, E) is 7.45% and 2-heptanol is 7.31 % are prominent⁶.

Uses

Aloe ferox is basically regarded for its laxative properties⁷. The leaves of *Aloe ferox* are boiled in water and taken for hypertension and stress⁸. It has also been proved by studies that the leaves have anti-oxidant properties⁹. *Aloe* leaves also have immune stimulating and anti-viral properties anti-cancer uses are also shown¹⁰ along with anti-diabetic activity¹¹.

***Aegle marmelose* (Rutaceae)**

Introduction

Aegle marmelose L. is a very slow growing tree belonging to the family of Rutaceae, the trunk of this tree is soft, short and thick. It is well-cultivated throughout India and is considered to be a sacred tree as a result of which it is abundantly grown in temple gardens. It is also cultivated in Northern Malaysia, Java, Pakistan, Egypt, Surinam, Trinidad, and Myanmar. The leaves are alternate and deciduous in nature, the odor of the mature leaves are disagreeable and the color of the new leaves are pink¹².

Chemical Constituents

Leaves of *Aegle marmelose* contains essential oils like d-limonene, 56% a,d-phellendrene, cineol, citronellal, citral, 17% of P-cynene, 5% cuminaldehyde. Besides the above mentioned chemical contents the leaves also have skimmianine, aegelin, lupeol, eugenol, marmesinin¹³. Further a flavonoid rutin has also been obtained from the leaves along with beta-D-glycoside¹⁴. Scopoletin (7-hydroxy-6-methoxycoumarin) has been isolated from the leaves of *Aegelmarmelose*¹⁵.

Uses

The leaf of this plant is used to treat a lot of human diseases amongst which are hyperglycaemia, hepatitis, asthma. Aqueous extract of the leaves of *Aegle marmelose* is very much useful in the long-

term management of diabetes¹⁶. Extract of the leaves has been successfully used as a liver-protecting agent¹⁷. Similarly work has been done to establish its anti-cancer role in the animal model of Ehrlich ascites carcinoma¹⁸. Scopoletin an active constituent of the leaves regulates hyperthyroidism, infact the activity has been found to be superior to the standard anti-thyroid drug propylthiourasil.

***Azadirachta indica* (Meliaceae)**

Introduction

Azadirachta indica A. Juss. is a small to medium sized tree, it is evergreen and it grows to a maximum of 30 meters in height. The crown of the tree is large and round, 10 to 20 meters in diameter with spreading branches, bark is somewhat thick. The leaves are alternate and crowded near the end of the branches, pinnate, 20-40 cm in length, green in color with 2 pairs of glands at the base or else glabrous, petiole is 2-7cm long. Leaflets are 8 to 19 in number with acuminate apex and unequal base. *Azadirachta indica* is native to India, Indonesia, Malaysia, Myanmar, Pakistan, Senegal, Srilanka, Thailand. This tree according to one source is the most researched in the world and is known to be the most promising tree of the 21st century¹⁹. The tree grows well in a wide range of factors which includes climatic, topographic and edaphic. It grows well in dry, hard soils and also on soils having tough clay. Plenty of Sunshine and little amount of water are also necessary²⁰.

Chemical Constituents

Chemical Constituents from an ethanolic extract of the leaves of *Azadirachta indica* indicated the presence of the following bioactive constituents, phytol, n-Hexadecanoic acid, Vitamin E, Glycerin, Thiamine, Eugenol, Dodecanoic acid, d-Mannose²¹. Other major active compounds present are azadirachtin, nimbanal, 3-deacetyl-3-cinnamoylazadirachtin, I-tigloyl-3-acetyl-II-methoxyazadirachtin, margocinin, margocilin, 22, 23 – dihydro – 23 beta- methoxyazadirachtin, 3-tigloylazadirachtol, 3-acetyl-salanno Vnimbidio Vmargocin²². Another active component gedunin has been extracted from the leaf and bark extracts of neem²³.

Uses

Neem leaf has got an effective anti-hyperglycemic and hypocholesteremic action in rabbits^{24,25}. Anticarcinogenic action was noted in the neem leaf extracts in murine systems²⁶. Neem leaf extract when injected to tumors in mice reduced tumor growth, showing anti-carcinogenic activity²⁷. Acetone-water neem leaf extract showed antiretroviral activity by inhibiting cytoadhesion, it also increased haemoglobin concentration, mean CD4+ cell count and erythrocyte sedimentation rate in HIV/AIDS Patients²⁸. Further there is a proliferation in the antibody production and cellular mediated response by the neem leaf extracts thus helping in the treatment of AIDS. The ethanolic leaf extracts of neem also causes cell death by inducing apoptosis in prostate cancer cells (PC-3)²⁹.

***Brassica campestris* (Brassicaceae)**

Introduction

Brassica campestris L. also known as turnip, turnip rape, field mustard, also known as turnip mustard³⁰. It is also known as fast plant, cultivated as a leaf vegetable, belonging to the family of Brassicaceae. Geographically it is distributed in Europe, Russia, Siberia, Asia Central Asia Minor, Afghanistan, Northern part of India, Iran, Argentina, Chile, and Uruguay.

Chemical Constituents

Mustard leaves have been reported to possess many bioactive substances and has antioxidant properties³¹. Glucosinolates have been found in them, which are sulphur containing secondary metabolites, their structure consists of a beta-D glucose moiety linked along with a sulphated thiohydroximate. The moiety linked to thiohydroximate or side chain varies and results in the formation of about 130 different types of glucosinolates³². Different types of glucosinolates occurring in the family Brassicaceae are Sinigrin, Gluconapin, Glucobrassicinapin, Glucoerusin, Glucoiberin, glucoraphanin Glucoallysin, Glucoibervirin all these belongs to the aliphatic group, the hydroxy aliphatic group consist of Progoitrin, Napoliferin, the cyclic group consists of Sinalbin, gluconasturtiin, glucotropaeolin while

glucobrassicin, neoglucobrassicin, 4-hydroxyglucobrassicin, 4-methoxyglucobrassicin are heterocyclic in nature³³.

Uses

Mustard leaf extracts also controls glucose metabolism, lowers lipid peroxidation and also the level of oxygen radicals thus cures the damage caused by Oxidative stress³⁴. *Brassica campestris* leaves are also protective against in vivo chromosomal damage and oxidative stress caused by gamma radiation and other genotoxic chemicals³⁵. Glucosinolates and the products derived from them have been reported to have beneficial effects in the health by reducing the risk of certain cancers in humans³⁶⁻³⁹. Dietary glucosinolates have been found to block the formation of various internal and external carcinogens thereby preventing the initiation of carcinogenesis⁴⁰. Glucosinolates and their hydrolytic products protect the cell against DNA damage by carcinogens and reactive oxygen species⁴¹. Further isothiocyanates obtained as a breakdown product of glucosinolates prevent the development of tumors by blocking the metabolism of carcinogenic compounds through biotransformation⁴²⁻⁴⁵. They also serve as suppressors of neoplastic process during the promotion phase. Indole-3-carbinol, which is produced from glucobrassicin, has anti-carcinogenic, antioxidant, and anti-atherogenic activity⁴⁶. Brassinosteroids like brassinolide has been shown to possess anti-viral activity against pathogenic viruses including herpes simplex virus type 1 (HSV 1), RNA viruses and measles viruses. These brassinosteroids inhibit cell growth of breast and prostate cancer⁴⁷⁻⁴⁹.

Cassia angustifolia (caesalpinaceae)

Introduction

Senna consists of dried leaflets of *Cassia senna* L. (*Cassia acutifolia* Delile), also known as *Alexandrian senna* and that of *Cassia angustifolia* Vahl. also known *Tinnevely senna*. Senna is a small shrub growing to a height of about 1 meter; the leaves are paripinnate compound leaves. *Cassia angustifolia* is found in Somaliland, Arabia, and

Sind and in Punjab it is cultivated in the Southern part of India (Tinnevely). Senna leaves and pods have been used as a medicine since the ninth or tenth century by the Arabian physicians⁵⁰.

Chemical constituents

The *Cassia* species is a very good source of mucilage, flavonoids anthraquinones, and polysaccharides⁵¹. Phytochemical investigations reveal that all of them consist of Kaempferol, and a combination of anthraquinones, which include chrysophanol, rhein, and physcion⁵². The active ingredients of the plant are called anthranoids of which dianthrones amounts to 75-80% and the anthrones amounting to 20-25%⁵³. The leaves and the pods of *cassia angustifolia* are having not less than 2.5% of anthraquinone glycosides mainly sennoside A and sennoside B, which are dianthrones obtained from rhein and aloe-emodin. Diacerein is basically synthesised from rein⁵⁴. Other active constituents obtained from the leaves of *Cassia angustifolia* are as follows emodin 8-O-sophoroside, sennoside C, Sennoside D, sennoside G, sennoside III, sennoside A₁, rheum-emodin glycoside⁵⁵⁻⁶³.

Uses

Although the leaves of *Cassia angustifolia* are used for laxative action, they also have a significant hepatoprotective action. Leaves of the plant are also used to stop bleeding⁶⁴. As a matter of fact that the leaves of *Cassia angustifolia* contains a good amount of rhein which makes the leaves suitable to be used as antiviral, antitumor, and anti-oxidant agent. Thus the leaves of *Cassia angustifolia* have antiviral and antitumor action. Leaves of *Cassia angustifolia* have got thrombolytic activity also⁶⁵.

Digitalis lanata (scrophulariaceae)

Introduction

Digitalis lanata Ehrh. Is a species of plant that is found in areas next to Danube in Central Europe apart from this it is also cultivated in England and in the United States of America. The leaves of this plant are sessile, oblong-lanceolate in shape, entire margin and glabrous⁶⁶. The name of the plant *digitalis* describes the shape of the purple flowers, which is like the shape of the finger⁶⁷.

Chemical Constituents

The active ingredient in the crude drug is glycoside which is a chemical compound having a sugar molecule linked to another molecule, this glycoside can be broken into a sugar and non-sugar moiety. The main glycosides of *Digitalis lanata* are the lanatosides ranging from A to E. The highest concentration of the cardiac glycosides is basically found in the leaves of *Digitalis lanata*. In one experiment the chemical constituents of *Digitalis lanata* was obtained using high performance liquid chromatography to ascertain the presence of cardiac glycosides in the leaf extracts, wherein the following active principles were found, Digoxigenin, Digitoxin, Digoxin, Deacetyl lanatoside C, lanatoside A, B, C, alpha acetyl digoxin, beta-acetyl digoxin, gitoxin, Digoxigenin-bis-digitoxoside and digitoxigenin⁶⁸.

Uses

Digitalis remains the oldest drug, which is used in the treatment of heart disease along being the most widely used. Digoxin obtained from *Digitalis lanata* is utilized in the treatment of auricular fibrillation and congestive heart failure⁶⁹. It is also indicated in the treatment of cardiac asthenia, in Graves although it is not used but it may sometimes correct the cardiac irregularities, it is also used in the treatment of epilepsy, and various other seizure disorders, it is also useful during dropsy and used to induce arrhythmias but at a higher dose level, they have also been used in the field of medical oncology and have shown promising anticancer effects, they have been shown to induce apoptosis on several types of tumor cells.

Embelia ribes (Myrsinaceae)

Introduction

Embelia ribes Burm.F. Is a large big shrub, spread throughout India, belonging to the family of Myrsinaceae. In Sanskrit it is called vidanga, leaves, roots, berries are all used in herbal formulas. It stimulates as well as calms and soothes the mind and body⁷⁰. It is found in Singapore, Burma, Srilanka, South China⁷¹. It basically has a rejuvenating effect on the whole system specially on the lymphatic system. In ancient ages it was used

as a blood purifier⁷². The leaves of this plant are simple, alternate, coriaceous, and elliptical-ovate-lanceolate, leaves are smooth, presence of dotted glands, short and obtusely acuminate, broad, entire, and perfectly glabrous. Lengthwise it is 3 inches long and 1^{1/2} inches broad, nodulated, petiole is 1 to 0.8 cm and with a prominent midrib⁷³.

Chemical Constituents

The main active compound is embelin, others are christembeline, volatile oil, quircetol, dacausterol, dihydroxyembelin, embelic acid, resins, embeliol, embelinol, embeliaribyl esters, gomphilactone, derivatives, homoembelin, homorapanone, monopotassiumembelate, quarvital 1%, rapanone, sitosterol, tannins, vidangin, vilangine⁷⁴.

Uses

Leaves of this plant are used as astringent in the treatment of several skin diseases along with the treatment of leprosy, apart from being an astringent it also has a thermogenic, demulcent and depurative action in a recent study it has been demonstrated that the BIR3 domain of XIAP (X-linked inhibitor of apoptosis) a new molecular target for designing novel anticancer drugs have been targeted by embelin thus assuring a promising compound for designing an entirely new class of anticancer drugs targeting BIR3 domain of XIAP. According to a medico botanical survey in the central region of the western ghats of India, it was revealed that the traditional medical practitioners residing in the vicinity of Lakkavali forest range of Bhadra wildlife sanctuary, India use the leaves of this species to cure critical cases of jaundice. Ethnomedicinal literature reveals the hepatoprotective use of the Leaves of *Embelia ribes*^{75,76}.

Heliotropium indicum (Boraginaceae)

Introduction

Heliotropium indicum L. is a plant belonging to the family of Boraginaceae also known as "Cock's comb" and in Ghana it is known as "Akongfematiko"⁷⁷. It is widely distributed in countries like West Africa, India, Phillipines and in north-to-north eastern regions of Brazil. It is an annual herb ranges from 30-90 cm, flowers are born

almost throughout the year, leaves are broadly ovate, upto 11cm long and 8cm broad undulate, dentate. This plant is found associated with the moist rich soils of the lowland tropics mainly near the rivers, lakes, on the roadsides, and in many waste areas. These are also found in the moist sandy soils and in shallow swamp area. The whole plant has got activity against tumors and cancers⁷⁸.

Chemical Constituents

The various chemical constituents are saponins, reducing sugars polysaccharides, phenols, tannins, cardiac glycosides, catechins, benzoquinone derivatives, naphthoquinones, fenantroquinones, sesquiterpene lactones, alkaloids, purines, steroids, along with triterpenoids, azulenes, carotenoids, depsides, depsidones, coumarin derivatives, and also present is anthraquinones⁷⁹, alkaloids were also found in the leaves⁸⁰.

Uses

Although the leaves of *Heliotropium indicum* has traditionally been used as ecobolics, abortifacients, antiarthritics, anti-rheumatics, eye treatments, febrifuges, vermifuge, and also as analgesics, anti-epileptic and also as anti-convulsant, it is also used in the management of hypertension in some West African countries like Ghana among the urban and rural dwellers. The aqueous extracts of *Heliotropium indicum* induces a muscarinic-receptor mediated negative ion tropic and chronotropic effect on the heart thereby producing a fall in the blood pressure, thus it can be used in the management of hypertension and in treating cardiac diseases. In countries like Ivory Coast and Ghana, the leaf infusion is used in the treatment of gonorrhoea⁸¹.

***Lactuca sativa* (Asteraceae)**

Introduction

Lactuca sativa L. is an annual plant belonging to the family of Asteraceae. It is generally grown as a leaf vegetable. It was first cultivated by the Egyptians who converted it from a weed to a plant developed for its leaves. The name lactuca means milk in Latin, which is obtained from its cut stems⁸² and sativa means sown or cultivated. It grows from mediterranean to Siberia, from USA to Western

Europe along with different parts of Asia. The leaves are colored green to red, there are also some varieties with golden, yellow or blue leaves. The shape is of a wide variety ranging from thick head of the iceberg type to the one shaped as gathers of fabrics.

Chemical Constituents

Lactuca sativa is a rich source of antioxidants like, quercetin, caffeic acid, vitamin C, Carotenoids⁸³⁻⁸⁵. Sesquiterpene lactones have been obtained⁸⁶, Phytols⁸⁷, carotenoids⁸⁸, polyphenol oxidase and phenols⁸⁹, proteins and micronutrients have also been obtained^{90,91}, other compounds are 3,14-Dihydroxy-11,13-dihydrocostunolide⁹² and 8-Tigloyl-15-Deoxylactucin⁹³.

Uses

Lactuca sativa possess strong antioxidant activity and they prevent chronic disease related to oxidative stress such as cancer. *Lactuca sativa* can be used as a neuroprotective via its antioxidant properties⁹⁴, they may also be used against ischaemic insults by means of their anti-inflammatory action^{95,96}, since they act as anti-inflammatory agents they can further be useful in cerebral strokes^{97,98}.

***Laportea ovalifolia* (Urticaceae)**

Introduction

Laportea ovalifolia Schumach. and Thonn. Chew has got two varieties namely *Laportea ovalifolia* male and female as a matter of fact, since they are from related species they possess similar features but differ in structure⁹⁹. Male leaves are bigger in size and the female leaves are smaller in size. *Laportea ovalifolia* is basically a herbaceous weed creeping in most of the cases than erect, covered with stinging hairs which are scattered. It is widely distributed in countries like Senegal, Angola, Nigeria, Gabon, and Cameroon. *Laportea ovalifolia* leaves are of economic importance in many countries like Nigeria, Gabon, Cameroon where the leaves are used as a traditional source of medicine for a number of health related issues, for instance the fresh leaves of *Laportea ovalifolia* is used to treat headache in Cameroon, cooked leaves are taken internally for stomach ache in Gabon.

Chemical Constituents

Chemo-microscopical analysis results have shown the presence of phenolic compounds. The bioactive compounds present are saponins, tannins; flavonoids, cardiac glycosides and these compounds are responsible for the therapeutic activity of the plant^{100,101}. Two compounds with significant bioactivity were found in the leaves of *Laportea ovalifolia*, one cerebroside, laportoside A, and a ceramide named laportomide A along with beta-sitosterol acetate, and beta-sitosterolglucopyranoside¹⁰².

Uses

The leaves of this plant is used in many countries of Africa in the treatment of Urinary infections, pneumonia, central nervous system disorders, apart from this a recent pharmacological study has shown its antidiabetic and hypolipidaemic activities. The cardiac glycosides are used in the treatment of asthma. Tannins in them are useful in the treatment of diabetes and rickets^{103,104}. The leaves of *Laportea ovalifolia* significantly reduce oxidative stress in diabetes¹⁰⁵.

CONCLUSION

Now days we see an increase in the demand for medicinal plants in both the developed and developing countries around the world, they are being used in the treatment of various diseases which are dreadful and life threatening like cancer, diabetes, HIV, anti-hyper lipidemic, Congestive heart failure and at the same time moreover because of the fact that they are having lesser or no side-effects, easily accessible and cost effective. In the recent years the use of medicinal and aromatic plants has increased greatly in India, China, and also western countries. In this article the medicinal uses of the leaves of some medicinal and aromatic plants has been described along with their chemical constituents, it has been suggested that studies on the foxglove leaves for the treatment of dropsy set the standards for suggested pharmaceutical chemistry, we do find the significant contribution leaves from medicinal plants can give to the entire

mankind by curing dreadful and life threatening diseases.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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