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PHARMACOGNOSTIC AND THERAPEUTIC ASPECTS OF *ALTERNANTHERA SESSILIS* (L.) IN THE MANAGEMENT OF VARIOUS DISORDERS: A COMPRESSIVE REVIEW

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ABSTRACT
Althernanthra sessilis commonly called as sessile joyweed and dwarf copperleaf is native to tropical and subtropical regions of the world. It is used as a vegetable specially in sri lanka and some asian countries. In certain regions of South East Asia, the leaves and young shoots are consumed as vegetables in karnataka, andhra pradesh and tamil Nadu, the leaves, flowers and tender stems are consumed as vegetables. As an herbal medicine, the plant has diuretic, cooling, tonic and laxative properties. It has been used for the treatment of dysuria and haemmorrhoids. The plant is also believed to be beneficial for the eyes, and is used as an ingredient in the making of medicinal hair oils and Kajal.

KEYWORDS: Sessile joyweed, ponnaganti, campesterol, anti-diabetic activity, anti-microbial activity.

INTRODUCTION

Alternanthera sessilis is a prostrate or procumbent, annual or perennial herb. The branches are raised from the root and are up to 50 cm long. They are often purplish in colour and glabrous. The leaves are fleshy, generally 1.3-3 centimetres long and 0.5-1 centimetres wide though the leaves are larger in wet habitats, linear-elliptic, oblong or obovate, apex rounded and base cuneate. The flowers are inconspicuous, white, borne in small, axillary heads; bracts are ovate or obovate and are 1 mm long. The bracteoles are shorter, persistent; subequal, ovate and acute. The seeds are orbicular. The plant bears flowers and fruits throughout the year.[1]

Figure 1: *Alternanthera sessilis* shrub.

Figure 2: *A. sessilis* twig with inflorescence.

***Alternanthera sessilis* Taxonomical Classification[2]**

Domain: Eukaryota	**Class:** Dicotyledonae
Kingdom: Plantae	**Order:** Caryophyllales
Phylum: Spermatophyta	**Family:** Amaranthaceae
Subphylum: Angiospermae	**Genus:** Alternanthera
	Species: *Alternanthera sessilis*

Vernacular Names[3]

Assamese: Matikaduri	Malayalam: Meenamgani, Ponnankannikkira
English: Sessile joyweed	Sanskrit: Matsyaki, lonica
Hindi: Gudrisag	Kannada: Honagone soppu
Kannada: Honagone soppu	Telugu: Ponnagantikura
Marathi: Bechkusal, Kanchari	Bengali: Chanchi, Haicha, Sachishak
Tamil: Ponnankanni, Citai, Koduppai	Manipuri: Phakchet

Botanical description

A spreading herb, upto 30 cm decumbent herbs, stem glabrous.

Leaves: 3-4 x 1cm, elliptic-oblong to oblanceolate, apex obtuse, base attenuate into a petiole, crenate, glabrous. Spike 7-12 x 5 mm, sessile, solitary or 2-3 together; bracts and bracteoles similar, 1 mm long, broadly ovate, acute, glabrous. This is a perennial herb with prostrate stems, rarely ascending, often rooting at the nodes. Leaves obovate to broadly elliptic, occasionally linear-lanceolate, 1–15 cm long, 0.3–3 cm wide, glabrous to sparsely villous, petioles 1–5 mm long.

Flower: In axillary spikes, sessile; white. Flowering from November-April. Flower in small axillary sessile heads, white often tinged with pink, bracteoles about 1 cm long, ovate, scarious; perianth long, sepals ovate, acute, thin, ovary obcordate, compressed, style very short, capitellate; no characteristic odour and taste. In the wild it flowers from December until March.

Fruit: A cordiform urticle 1.5 mm. long strongly compressed; seed orbicular. orbicular, compressed with thickened margins; no characteristic odour and taste. Fruiting December onwards.

Root: Cylindrical, 0.1 to 0.6 cm. diameter, cream to grey, numerous roots arising from the main tap root as lateral rootlets; fracture short; no characteristic odour and taste.

Seed: The seed is lenticular, 0.5 to 1 mm in diameter, glossy brown seed coat, slightly reticulate.

Inflorescence: The sessile inflorescences are in axillary position and are isolated or grouped (up to 5). They are subglobose, they measure between 5 and 7 mm in diameter and are white.

Stem: Herbaceous, weak, cylindrical, with spreading branches from the base; yellowish-brown to light-brown; nodes and internodes distinct.[4,5]

Geographical Distribution

Alternanthera sessilis has a pantropical distribution, being present throughout the Old World tropics, tropical Africa, southern and eastern Asia and Australia. The native range is uncertain (Gupta, 2014). Many Chinese publications (e.g. Fan et al., 2013) describe it as native to China, and USDA-ARS (2014) lists the native range as China and southern to southeastern Asia. It is reported as native to some of the Pacific Ocean island groups and as introduced to others.[6] However, the most recent study of the genera Alternanthera suggests that A. sessilis originated in South America and from here was introduced to the Old World.[7] This is a pioneer species, typically growing on disturbed parts of a variety of

wetland habitats, often in species-rich associations with a range of other aquatic and wetland plants. It grows in the draw- down zones of water bodies or in water up to 1 m deep, where it may be part floating and part emergent or even grow in mats of floating vegetation. It is a typical plant of the flood plain wetlands, margins of rivers, streams, canals, ponds, reservoirs, tanks in India; About 16 species, throughout hotter regions of India and Ceylon in damp places, ascending the Himalayas to 4000 ft, and in all warm countries.[8,9]

Biology and ecology

Alternanthera sessilis prefers places with constant or periodically high humidity, but may however tolerate extremely dry conditions. It often grows in mixed association with several other aquatic species. The propagation of the plant is spreads by seeds, which are wind-and water-dispersed, and by rooting at stem nodes. On basis of Siddha, It grows in Marutham thinai.[10]

Homotypic Synonyms

Achyranthes sessilis (L.)	*Allaganthera forsskaolei*
Gomphrena sessilis L.	*Illecebrum sessile* (L.)
Paronychia sessilis (L.)	*Paronychia tetragona*

Heterotypic Synonyms

Achyranthes linearifolia Sw. ex Wikstr	*Achyranthes villosa* Blanco
Achyranthes polygonoides (L.)	*Alternanthera achyranth*
Achyranthes triandra Roxb.	*Alternanthera achyranthoides*
Achyranthes repens Elliott	*Alternanthera denticulata* var. *bifaria*
Alternanthera denticulata var. *major*	*Alternanthera dubia*

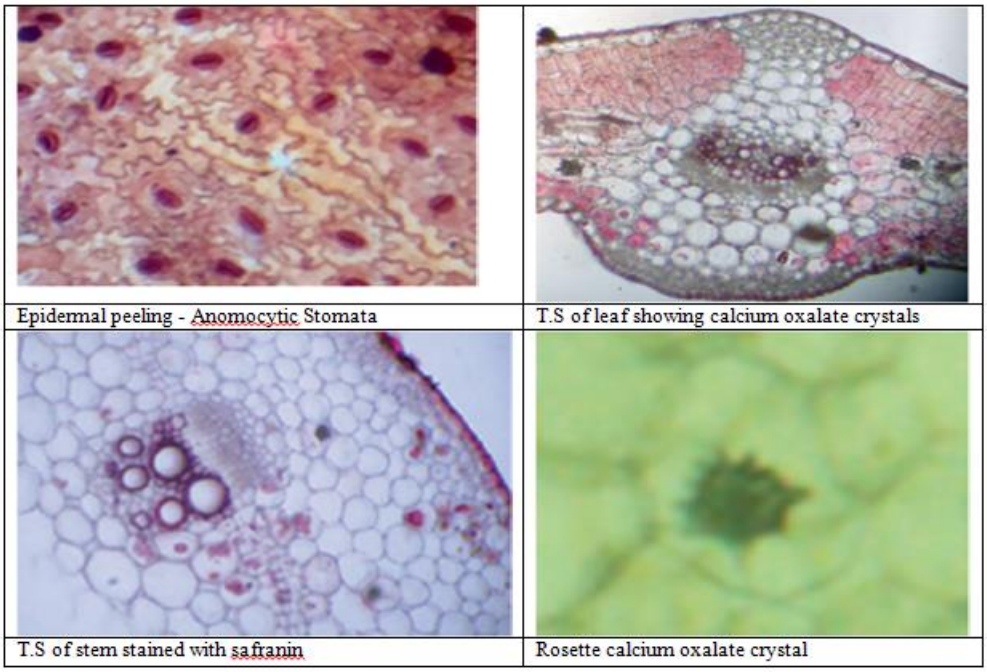

Figure 3: Pharmacognistic features of *Alternanthera Sessilis.*

Chemical Constituents

Herb contains 2, 4- methylenecycloartanol and cycloeucalenol, choline, oleanolic acid. Saponins have been isolated from the leaves. Roots contain lupeol17. Young shoots contain protein and iron. It also contains 5-a - stigmasta-7-enol. The β- sitosterol possess potent anti- inflammatory by reducing the secretion of pro inflammatory cytokines and TNF.

The plant contains an array of chemical constituents viz β sitosterol, stigmasterol, campesterol, α-spinasterol, oleanic acid, rhamnoside, methylene cycloartenol, cycloeucalenol, lupeol, 5-α-stigasta-7-enol and its palmalitate, nonacosane, 16-hentriacontane, handianol. oxalic acid, saturated aliphatic hydrocarbon, ester and saturated ester.[11] Katyakini Muniandy et al., reported that the hydroethanolic extract of *Alternanthera sessilis* showed 50 prominent peaks in GC-MS analysis.

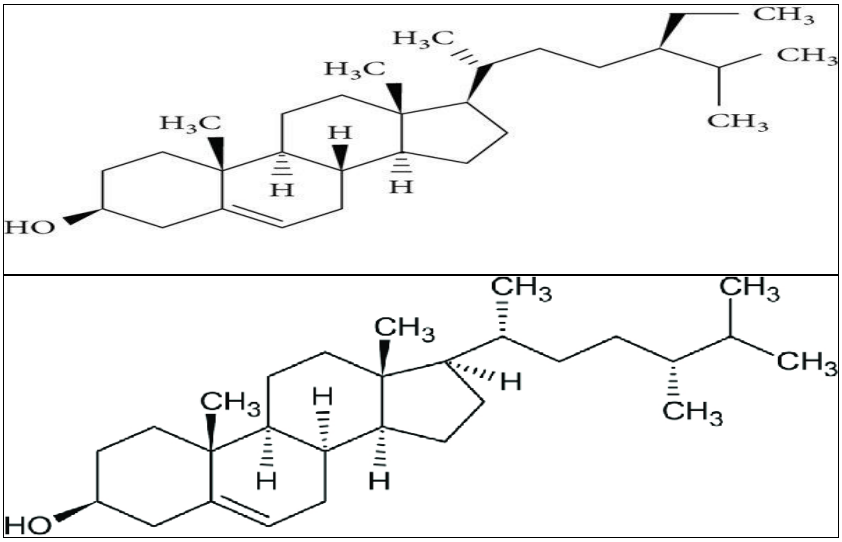

Figure 4: Chemical Structure of β sitosterol & campesterol.

Periyakali saravana Bhavan et al., reported the presence 17 secondary phytochemicals among them 5 compounds possessed bioactive properties.[12] Kallappa M Hosamani et al., reported the presence ricinoliec acid in the seed oil.[13] Shridhar and Lakshminarayana reported that the leaves of A.sessilis contained good amounts α-tocopherol and β-tocopherol.[14] Ragasa et al., isolated a mixure of diasteriomers of new ionone derivatives which showed low anti -microbial activity against pseudomonas aeruginosa and Trichophyton mentagrophytes.[15]

Traditional uses

Alternanthera sessilis (L.) DC. (Sessile joy weed) is a popular leafy vegetable its leaves and young shoots are eaten as vegetable[16] or cooked in soup in Sri Lanka and also used as traditional medicine in China, Taiwan and India.

Alternanthera sessilis (Amaranthaceae) is widespread throughout the tropics and subtropics and is an annual or perennial prostate herb with several spreading branches, bearing short petioled simple leaves and small white flowers, found throughout the hotter part of India, ascending to an altitude of 1200m[17] in the Himalayas and even cultivated as a potherb. The plant grows wild, but is also cultivated for food, herbal medicines, and as an ornamental plant.[18] The aquarium plant *Alternanthera reineckii* is sometimes misidentified as *A. sessilis*.[19]

In certain regions of South East Asia, the leaves and young shoots are consumed as vegetables.[20]

In places like Karnataka, Andhra Pradesh, Tamil Nadu and Sri Lanka the leaves, flowers and tender stems are consumed as vegetables. The plant is shredded finely and stir fried with grated coconut and spices to make a salad-like dish that is most commonly eaten as a rice accompaniment.[21]

The leaves are crunchy, slightly more so than the temperate climate spinach, and not slimy. Some cultivars are slightly bitter. They require steaming or boiling when eaten in large quantities because of the presence of oxalates.[22]

It is eaten alone as a green or added to other dishes as a spinach substitute. Reportedly, Brazilians usually eat it raw in salads with oil and or vinegar, tomato, and onion, although the literature recommends cooking it.

The vegetable can be added to quiches, pies, curries, dals, pasta sauces, lasagna or added to dishes and stir-fries late in the cooking process as a spinach substitute and to add a nutty flavour.[23]

Biochemical analysis were carried out to find total Carbohydrate, Starch, Protein, Amino acid, Vitamin B1 and Vitamin B2 according to the procedure of Association of Official Analytical Chemist. The cooking quality was analyzed for total Carbohydrate, Starch and ProteinsAs a herbal medicine, the plant has diuretic, cooling, tonic and laxative properties. It has been used for the treatment of dysuria and haemorrhoids. The plant is also believed to be beneficial for the eyes, and is used as an ingredient in the making of medicinal hair oils and kajal.[24]

Alternanthera sessilis is known as Matyakshika in Ayurvedic medicine. It has been used in Indian traditional system of medicine since a long time in diseases due to vitiated blood, skin diseases and ulcers.[25]

Its active principles, extracted in oil, were used to treat infected wounds and the herb also proved styptic in colitis; its nutritive values make the herb a potent tonic with a wide range of applications.

Poultice of pounded fresh material is used in sprains, burns and eczema, carbuncle, erysipelas and acute

conjunctivitis. A decoction is recommended as a herbal remedy to treat wounds, flatulence, nausea, vomiting, cough, bronchitis, diarrhea, dysentery and diabetes. Its roots can relieve inflamed wounds.

The leaves and shoots are boiled and drunk as an antihypertensive remedy. It is also used as a cholagogue, galactogogue, abortifacient, febrifuge and to treat snakebites, dysentery, diarrhea, skin problems inflamed wounds and boils, and applied externally on acne and pimples.

In some parts of Bihar (India) the plant is used for hazy vision, night blindness, and post- natal complaints.

A. sessilis has been reported to possess anti-microbial, molluscicidal, a moderate antimutagenic, antidiarrhoeal, hepatoprotective, cytotoxic and antiviral activities.[26]

Degenerative and necrotic changes in the liver and kidney in Swiss mice, caused by oral administration of water extract of *A. sessilis* in high doses was revealed through histopathological test.[27]

Previous phytochemical studies have reported the isolation of flavonols, triterpenoids, steroids and tannins; ß-sitosterol, stigmasterol, campesterol, lupeol being few of its important constituents.

The petroleum ether and benzene extracts inhibit the growth of some human and plant pathogenic bacteria. Previous study on this plant showed that it has hepatoprotective activity and potent nootropic activity.[28]

The precious method in the Siddha Medicine is 'Food as medicine'. In that way, eating of sessile leaves is fried with ghee, which gives cooling effect to eyes, disease free life. It acts as a good anti-oxidant. Relieves floating abdomen, liver diseases, vatha diseases.

The leaves are very effective in treating in cuts & wounds, antidote for snake bite & scorpion sting and skin diseases. It calcifies copper into red powder (chind), which is very useful in gastric & duodenal ulcers, tamarind should be avoided.

Medicated oil prepared out of the juice of sessile plant as chief ingredient, used as bathing oil, gives cooling effect to eyes & body, neuritis, treating eye, piles, Halitosis. Dried whole plant is used as blood purifier and cures Skin diseases.[29]

Quantitative microscopy of *Alternanthera sessilis*

S N	Quantitative microscopy of *A. sessilis*	Numbers
1	Stomatal number	82
2	Stomatal Index	113.8%
3	Vein–islet number	33.5-37/Sq.mm
4	Vein termination number	28-31/Sq.mm
5	Trichome length	1227.4-1431.9 µm
6	Trichome breadth	122.7-204.6 µm

CONCLUSION

Our forefathers had a special way of transferring and documenting traditional heritages. one among them is through documenting the traditions through popular sayings for example our focused herb *Alternanthera sessilis* has two such popular sayings, one is About the transformation of body into golden luster and the other one is regarding the clarity of the eyes to visualize the stars even in broad day light when this green is consumed periodically as mentioned in the traditional literatures. These sayings may look like exaggerated once but it has been proved through in-vitro and in-vivo studies that this Green has proven anti-microbial, wound healing activities, anti-oxidant activities, antipyretic activity, nootropic activity, hepatoprotective activity, hematinic activity, anti- ulcer activity, hypoglycemic activity, anti-diarrhoeal property, anti- Inflammatory activity.

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