



## Review Article

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# Ethnobotanical and Phyto pharmacological Overview of Matsyakshi (*Alternanthera sessilis* R Br.ex DC)

Karnam Chandrashekhara<sup>1</sup>

<sup>1</sup> Professor, Department of Dravyaguna, V.Y.D.S. Ayurveda Mahavidyalaya, Khurja, Bulandshah (Dist) Uttar Pradesh, India

## ABSTRACT

*Alternanthera sessilis* (Amaranthaceae) is commonly called as sessile joy weed or dwarf copper leaf, has been a part of Indian health care system including different streams of medicinal plant practices such as Ayurveda, ethnobotany and folklore medicine for treating different conditions. The plant does not find vivid description in ancient classics of Ayurveda, but, its different uses are appreciated by the tribes and ethnics of India. This necessitates the scientific studies to validate the claims and further, to promote the research on the plants that are less explained and under-utilized in Ayurvedic therapeutics. The aim of this review is to create a basis for further investigation into the ethnobotanical claims and the biological activities to support its multiple uses.

**Keywords:** Matsyakshi, *Alternanthera sessilis*, Ethnobotanical study.

## INTRODUCTION

The Family Amaranthaceae consists of 65 genera and 850 species distributed throughout the world. While, it includes 17 genera and more than 50 species in India [1]. The genus *Alternanthera* consists of 139 species [2]. Among them, *Alternanthera sessilis* R Br.ex DC is considered as the true botanical source of *Matsyakshi* in Ayurveda [3]. The plant finds a small place in ancient classics of Ayurveda, but has been used mainly by the rasavidyas of Rasashastra [4]. It entered as an ingredient of some classical formulations. It is an annual herb growing as a weed spread across India, Nepal and Srilanka [5]. Central council of research and siddha (CCRAS) has documented its different actions such as anti mutegenic, carcinogen suppressors, anti-ulcer, molluscicidal, hepatoprotective, cardiac depressant and cholinergic [6].

## Plant profile:

### Taxonomic tree:

Kingdom-Plantae  
Division-Magnoliophyta  
Subdivision-Angiospermae  
Class-Magnoliopsida  
Subclass-Caryophyllidae  
Order-Caryophyllales  
Family-Amaranthaceae  
Genus-*Alternanthera*  
Species-*sessilis* (L) R. Br.ex DC

## Plant Profile

*Alternanthera sessilis* R Br.ex DC (AS) is commonly known as sessile joy weed (English); Chanchi (Bengali); Garundi (Hindi); Honnagonne soppu (Kannada); Meenam gani (Malayalam); Kanhari (Marathi); Ponnann kanni citai (Tamil); Ponnaganti kura (Telugu); Koypa (Konkani); Madaranga (Oriya); Phakchet (Manipuri); and Panini nib haji (Gujarti). It is distributed in the hotter parts of India [7] and damp parts of south India [8].

## Botanical Description

B.N- *Alternanthera sessilis* (L) R. Br.ex DC

It is a perennial herb with prostrate (Figure-1) or sometimes ascending to a height of 15-50 cm. Root-tap

## \*Corresponding author:

Karnam Chandrashekhara

Professor, Department of  
Dravyaguna, V.Y.D.S. Ayurveda  
Mahavidyalaya, Khurja,  
Bulandshah (Dist) Uttar Pradesh,  
India

Email: dkarnam[at]yahoo.com

root, branched, white or brown, adventitious roots striking at the nodes. Stem-cylindrical, many branched, hairy. Branches-10-40cm long, glabrous, nodes villous, petiole-1-5mm long, Leaves-simple, fleshy, linear-oblong, lanceolate, glabrous or sparsely villous, apex-subacute or obtuse, base-attenuated in to petiole, margin-entire or crenate, phyllotaxy-opposite or clustered, Inflorescence- solitary or 2-3 heads at the axils(Figure-2). Flower-sessile, scarious bracts, bractioles-short, ovate, perianth-small, tepals-acute, ovate, 1 nerved, stamens 5, filament- short, anther- 1 celled, ovary-compressed, style-short, stigma-capitellate, fruit-urtilce, compressed, seed-sub-orbicular, brown.



Figure 1: *Alternanthera sessilis*(L) R Br ex DC



Figure 2: Flowers in spike

#### Ethno botanical claims from different parts of India

It is consumed as vegetable (Barukial J *et al.*,<sup>[8]</sup> (Reddy KN *et al.*,)<sup>[9]</sup> (Mathur M *et al.*,)<sup>[10]</sup>(Jiji P)<sup>[11]</sup> and used for hair growth, stomach trouble(Jiji P)<sup>[11]</sup>, to increase the flow of milk in mothers(Jiji P)<sup>[11]</sup> (Panda A &Mishra MK)<sup>[12]</sup>,to increase the flow of bile(Panda A &Mishra MK)<sup>[12]</sup> to reduce swelling(Sangita Horo & salonu Topno)<sup>[13]</sup>, Joint pain(Hiremth VT *et al.*,)<sup>[14]</sup>, improve the eye sight and to treat stomach pain and greying of hair(Jenny MOL PA& Suganthi A)<sup>[15]</sup> gonorrhoea(Singhal A *et al.*,)<sup>[16]</sup> leucorrhoea(Panda A &Mishra MK)<sup>[12]</sup> <sup>[17]</sup> diarrhoea (Poonam *et al.*,)<sup>[18]</sup> (Miteya,B B)<sup>[19]</sup> (Tiwari AP *et al.*,)<sup>[20]</sup> burning sensation(Poonam *et al.*,)<sup>[18]</sup>, skin disease (Poonam *et al.*,)<sup>[18]</sup> (Miteya,B B)<sup>[19]</sup> (Tiwari AP *et al.*,)<sup>[20]</sup> fever(Poonam *et al.*,)<sup>[18]</sup> dyspepsia (Miteya, B.B)<sup>[19]</sup> (Vishnuvardhan *et al.*,)<sup>[24]</sup> tooth ache, piles(Prasad SK &Singh BN)<sup>[21]</sup>, hematemesi(Savita Rani & Rana.JC)<sup>[22]</sup> night blindness, leprosy and swelling(Shiddamallayya N *et al.*,)<sup>[23]</sup>. It is used to promote intellect (Shiddamallayya N *et al.*,)<sup>[23]</sup>, as an eye washer(Miteya,BB)<sup>[19]</sup>, to reduce the temperature(Panda A &Mishra MK)<sup>[12]</sup> and to treat anaemia(Sangita Horo & salonu Topno)<sup>[13]</sup> (Vishnuvardhan *et al.*,)<sup>[24]</sup> insect bites, snake bites and constipation(Vishnuvardhan *et al.*,)<sup>[24]</sup>.

#### Ayurvedic properties <sup>[25]</sup>

Rasa (Taste) - Madhura(Sweet)Tikta (Bitter) Kashaya(Astringent)

Guna (Property)-Laghu(Light)

Vipaka(Post digestive effect)-Katu(Pungent)

Veerya(Potency)-Sheeta(Cold)

Doshagnata-Kapha pitta hara (mitigates kapha and pitta)

#### Chemical constituents

The plant contains an array of chemical constituents viz  $\beta$  sitosterol, stigmasterol, campesterol,  $\alpha$ -spinasterol,oleanic acid,rhamnoside,24-methylene cycloartenol,cycloeucalenol,lupeol,5- $\alpha$ -stigasta-7-enol and its palmitate,nonacosane,16-hentriacontane, handianol. oxalic acid, saturated aliphatic hydrocarbon, ester and saturated ester<sup>[6]</sup>. Katyakini Muniandy *et al.*, reported that the hydroethanolic extract of *Alternanthera sessilis* showed 50 prominent peaks in GC-MS analysis. The most post prevailing compounds were identified as 2,4 -dihydroxy-2,5-dimethyl-3(2H)-furan-3-one(8.92%),hexadecanoic acid <n-> (7.21%),2-1,2,4-trioxolane,3 phenyl-(5.99%) palmitate <ethyl->( 5.65%) and L-glutamic acid (5.04%)<sup>[26]</sup>. Sivapragasam Gothai *et al.*, identified higher hydrocarbons, alkanes, esters terpenes, flavonoids,organic compounds,steroids and fatty acids among 13 phyto-constituents isolated by GC-MS analysis<sup>[27]</sup>Khan *et al.*, isolated the major compounds of essential oil of flower based on the prominent peaks were 1,1,1, 5,5,5,-hexa methyl-3-3-bis [trimethylsilyl]oxy] trisiloxane(17.76%),trans-4-ethyl-5-octyl-2,2-bis (trifluoromethyl)-1,3-dioxolane(11.12%) and tetrahydro-2,5-dimethoxy furan(9.10%). The major components of essential oil of leaves were identified as 1,1,1,5,5,5 -hexamethyl-4-N-pentylthiane(11.27%) didodecylphthalate (10.62%) and tetrahydro-2,5,-dimethoxyfuran (10.01%) by GC-MS analysis<sup>[28]</sup>.

Periyakali saravana Bhavan *et al.*, reported the presence 17 secondary phytochemicals among them 5 compounds possessed bioactive properties<sup>[29]</sup>. Kallappa M Hosamani *et al.*, reported the presence ricinolic acid in the seed oil<sup>[30]</sup>.Shridhar and Lakshminarayana reported that the leaves of *A.sessilis* contained good amounts  $\alpha$ -tocopherol and  $\beta$ -tocopherol<sup>[31]</sup>. Ragasa *et al.*, isolated a mixture of diastereomers of new ionone derivatives which showed low anti -microbial activity against pseudomonas aeruginosa and Trichophyton mentagrophytes<sup>[32]</sup>.

#### Pharmacological activities

##### Anti-diabetic activity

K.K Tan and K.H Kim investigated the anti-diabetic activity of *Alternanthera sessilis* R ethyl acetate fraction (ASEAF) in obese type-2 diabetic rats. The results showed that HOMA indexes of ASEAF treated group were significantly lower than the negative control. While, QUICKI values were significantly higher than the control group suggesting that ASEAF improved the insulin resistance conditions in diabetic rats. The study revealed that the plasma TG level and plasma FFA levels of ASEAF treated rats were decreased by 42.04% and 34.38% respectively. The researchers affirmed that ASEAF possess anti-hyperglycaemic effect, anti triglyceridemic effect and pancreatic protective effect in obese type-2 diabetic rats<sup>[33]</sup>.

##### Anti-microbial and wound healing activity

Jalalpure *et al.*, conducted an animal study to investigate the antimicrobial and wound healing activity of the chloroform extract of leaves of *Alternanthera sessilis*. The chloroform and acetoneextracts showed maximum zone of inhibition against almost all the organism in cupplate method.The significant MIC value in turbidimetric method was

shown by chloroform extract. The chloroform extract of *Alternanthera sessilis* leaves at the dose 200mg/kg body weight p.o showed significant wound healing activity compared to the control in excision wound model, incision wound model and granuloma studies [34].

#### Anti- asthmatic activity

S. Fatima *et al.*, conducted a study to investigate the anti-asthmatic activity of ethanolic extract of *Alternanthera sessilis* in the dose of 500mg/kg p.o in guinea pigs. It was focussed on the bronchial hyperactivity by histamine aerosol induced bronchospasm in guinea pigs and broncho alveolar lavage fluid studies (BALF) in egg albumin sensitized guinea pigs. The result showed that the ethanolic extract significantly increased the PCT and percentage protein protection and the study on BALF showed increased in the number of TC and DC of leucocytes which suggests anti-inflammatory action. In a nutshell, the leaves of ethanolic extracts of *Alternanthera sessilis* exert anti-inflammatory and anti asthmatic activity [35].

#### Antipyretic activity

Praveen singh *et al.*, conducted animal study to investigate the antipyretic activity of ethanolic extract of *Alternanthera sessilis*. The drug was given at a dose of 200mg/kg and 400mg/kg body weight to different groups of in-bred wister albino rats. The result showed the significant reduction of body temperature in the experimental animals [36].

#### Hepato protective effect

Borthakur *et al.*, reported the hepato protective activity of *Alternanthera sessilis*. The study was conducted on the wister rats after inducing hepato toxicity by CCl<sub>4</sub>. The aqueous extract of *Alternanthera sessilis* was given at 100mg/kg body weight, 300mg/kg body weight and 900mg/kg body weight to three groups respectively and concomitantly with CCl<sub>4</sub> toxicity. The results showed that the aqueous extract of *Alternanthera sessilis* had significantly hepatic enzymes levels in blood which was supported by the regenerative changes in the histopathological examination [37].

#### Nootropic activity

Surendra kumar *et al.*, conducted a study to appraise the nootropic activity of aqueous and ethanolic extract of the aerial parts of *Alternanthera sessilis* L in albino rats at the doses of 125mg/kg, 250mg/kg and 500mg/kg. The response was noted on the 9<sup>th</sup> day and compared with the standard drug pircetam. Both aqueous and ethanolic extracts of aerial parts of *Alternanthera sessilis* L reversed the memory deficit induced by scopolamine hydrobromide, increased the number of entries and duration of time in enclosed arm. However, the ethanolic extract treated group showed a slightly significant results when compared to aqueous extract treated group [38].

#### Anti -oxidant activity

Yadav *et al.*, 2011 conducted an in-vitro study to investigate the anti-oxidant activity and free radical scavenging activity of *Alternanthera sessilis*. Total anti-oxidant activity and free radical scavenging activity were evaluated by phosphomolybdate method and DPPH method respectively. In Phosphomolybdate method the highest activity was shown by methanolic extract. The highest radical scavenging activity by DPPH method was found in methanol extract. Ferrous chelating activity,

Superoxide radical scavenging activity, Nitric oxide radical scavenging activity was found high in acetone, acetone and methanol extracts respectively. The study revealed that *Alternanthera sessilis* is a potent radical scavenging and metal ion chelating activity [39].

#### Anticancer activity

Sivapragasam Gothai *et al.*, conducted a study to identify the bioactive extract from *Alternanthera sessilis* and to investigate its cytotoxicity potential against colon cancer cells. The cytotoxicity of *Alternanthera sessilis* plant parts on HT29 and 3T3 cell lines was investigated through MTT assay. The result showed the reduction of MTT by mitochondrial dehydrogenase to purple coloured formazan. HT 29 cell line responded to the cytotoxic effects in a dose dependent and time dependent manner. The extracts exhibited selective cytotoxicity against fibroblast cell 3T3. Clonogenic formation assay reconfirms long term anti-proliferative activity of *Alternanthera sessilis* [27].

#### Haematinic activity

Haematinic activity was investigated by giving the test drug in four different doses to anaemia induced male and female swiss mice and sprague dawley rats. The results were compared with the standard drug ferrous sulphate which saved as positive control and H<sub>2</sub>O is negative control. The result showed that *Alternanthera sessilis* was found to be a potential drug for augmentation of haemoglobin and serum ferritin in Iron deficiency anaemia [40].

#### Formulations [6]

*Aindra rasayana*  
*Nyagrodhadya Ghrita*  
*Dhanwantara Ghrita*  
*Grahani mihira taila*  
*Brihat Grahani mihira taila*  
*Trikantaka ghrita*

#### CONCLUSION

On analysing all the available literature on the plant *Matsyakshi* (*Alternanthera sessilis* (L) R Br Ex DC), it is evident that it has many phytochemicals that can be utilized well in preparing the new drug candidate. The pharmacological studies support its anti-asthmatic, haematinic activity, anti-cancerous activity, nootropic, antipyretic, anti-inflammatory, anti- oxidant, hepato protective and wound healing activity. These data provide a sufficient basis to use it as a drug in human ailments. Though, Ayurveda appreciated it less, yet the ethno botanical studies mentioned, will set a foundation to launch new researches on the plant. This review, in this direction, help the researchers to come up with new thoughts on the plant to investigate its efficacy in hematemesis, haemorrhoids, night blindness and also as a galactagogue.

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**Conflict of Interest:** None

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