

ORIGINAL RESEARCH ARTICLE

A Phyto-Pharmacognostic Research on *Matsyakshi* (*Alternanthera sessilis* (L.)R.Br.ex.DC)

Author: Pallavi V Kashyap¹

Co Authors: Shrikanth P², Niveditha Shetty³ and Suchitra N Prabhu⁴

¹⁻⁴Department of DravyaGuna Vijana, Sri Dharmasthala Manjunatheswara College of Ayurveda and Hospital, Udupi, Karnataka, India

ABSTRACT

Objective: To determine the Pharmacognostic and Phytochemical analysis of the whole plant of *Matsyakshi*(*Alternanthera sessilis* (L.)R.Br.ex.DC) and to analyze its results.

Materials and Methods: Whole plant of *Matsyakshi* was examined for its macro-microscopic features and pharmacognostic standardization parameters were determined according to WHO guidelines. Parameters such as loss on drying, total ash, acid insoluble ash and extractive values were determined. The preliminary phytochemical tests and HPTLC were performed for the identification and standardization of *Alternanthera sessilis*.

Conclusion: The odor, color, surface texture of the plant was noted. Microscopic characteristics revealed the presence of starch grains in T.S of leaf, trichomes and rosette crystals in T.S of Stem, Preliminary phytochemical tests revealed the presence of steroids, tannins and coumarins. HPTLC analysis revealed that there are 11 bands in long UV range, 5 bands in short UV range and 5 band after derivatization. In densitometry scan 10 peaks at 254nm, 13 peaks at 366nm and 8 peaks at 620nm. The long UV range had more number of bands and fewer bands in short UV range.

Key Words *Matsyakshi*, *Alternanthera Sessilis*

INTRODUCTION

In Ayurveda the Dravya is classified into *Jangama*, *Oudbhida* and *parithiva*. *Oudbhida* is classified into *Vanaspati*, *virudha*, *vanaspatya* and *Ousadhi*. *Vanaspati* is defined as that plants which bears visible flowers and then bears fruits¹. *Acharya charaka* mentions that nomenclature & morphology of the plants are to be obtained from the people living in forests. The *nama jnana* & *rupa jnana* is not sufficient, so one should learn about its *aushada guna*¹. To determine the

aushada guna of the *dravya*, the various characteristics of the *dravya* plays a vital role like nature, qualities, specific action, place of growth, season of collection, method of preservation, method of processing, dosage¹. In the modern science, the standardization of the medicinal plants helps in evaluating the quality and purity of crude drug by the means of various parameters like morphological, microscopical, physical, chemical and biological². These parameters help the researchers in the new drug development and

ORIGINAL RESEARCH ARTICLE

also develop novel medication which can be beneficial for humans.

Alternanthera sessilis (L.)R.Br.ex.DC belongs to Amaranthaceae family of flowering plants. The term *Alternanthera* refers to the stamens being alternately fertile and barren³. It is commonly called as sessile joy weed in English and is considered as a one among the notorious weed of the Amaranthaceae family. It is commonly seen in moist places near the pond, tanks and agricultural lands⁴. In some parts of India *A.sessilis* is been used as vegetable in various food preparations. Among the traditional practitioners the plant *A.sessilis* is been used for skin problems, eye disorders, as blood purifier, in joint pain and other ailments⁵. In Ayurveda the plant *A.sessilis* is been used as *Matsyakshi*, where the flowers of the plants resembles to that of fish's eye. In classics, *Matsyakshi* is used in diseases caused to pitta, kapha and rakta⁶.

AIMS AND OBJECTIVES

To determine the Pharmacognostic and Phytochemical analysis of the whole plant of *Matsyakshi*(*Alternanthera sessilis* (L.)R.Br.ex.DC) and to analyze its results.

MATERIALS AND METHODS

1) Literary review

Botanical name: *Alternanthera sessilis* (L.)R.Br.ex.DC)

Family: Amaranthaceae

Habitat : Throughout the hotter parts of India and very common in moist places , especially around the tanks, ponds , and as weed in gardens⁷.

Vernacular names⁸:

Sanskrit : Mastyakshi

English : Joy weed

Hindi : Gudrisag

Kannada : Honngonesoppu

Synonyms: matsyagandha , brahmi , nadikalayaka , gandali , meenakshi , somavallari , vayasya , bahilika , mastiyadani.

Rasapanchaka⁸:

Rasa :Kashaya , Titkta , Madhura

Guna : Laghu

Virya : Sheeta

Vipaka : Katu

Dosha karma : Kapha Pittahara

Karma : Rakta vikara and Kusta

Pharmacological activities⁹: Anti- cancer, Anti-oxidant , Anti-microbial , Haematinic activity , Wound healing activity , Anti-Diabetic activity, Anti-Asthmatic acitivity , Anti-Pyretic activity, Hepato-Protective effect , Nootropic activity.

Ethno botanical uses⁵

1. The herb is used as Galactagogue , Cholagogue , Abortifacient and Febrifuge
2. It used for indigestion
3. It used to be a good fodder which increases milk in cattle
4. In some parts of Bihar, the plant is used for hazy vision, night blindness, diarrhoea and post-natal complaints. The roots are being used for inflamed wounds as an external application.

ORIGINAL RESEARCH ARTICLE

5. Whole plant juice is given as a tonic for weakness.

6. Oil prepared using plant juice is applied to head for sleeplessness, eye diseases and biliousness and wounds

2) **Macrosopy:** The external features of test sample were documented using canon IXUS digital camera. The macroscopic features were compared to local floral for authentication.

3) **Microscopy:** The whole plant of *matyakshi* was collected from the farm at udyavara. Sample was authenticated by the Botanist. The samples were preserved in Sri Dharmasthala Manjuntheshwara Research Centre, Udupi, Karnataka with sample number Ref no 1184/20031601 on 16-03-2020. Sample was preserved in fixative solution. The fixative used was FAA (formalin-5ml+ Acetic acid-5ml +70% Ethyl alcohol-90ml). The materials were left in FAA for more than 48hours. The preserved specimens were cut into thin transverse section using a sharp blade and the sections were stained with saffranine. The slides were also stained with iodine in potassium iodide for detection of starch. Transverse sections were photographed using Ziess AXIO trinocular microscope attached with Ziess AxioCam camera under bright field light. Magnification of the figures is indicated by the scale-bars.

4) **Physico-chemical parameters:** loss on drying, total ash , acid insoluble ash , water soluble , alcohol soluble extract , water soluble extract.

5) **Preliminary phytochemical analysis :** Tests for alkaloids , carbohydrates , steroids ,

saponins , tannins , flavonoids , phenol , triterpenoids , carboxylic acid , resin and quinine.

6) **HPTLC:** 1g of *Matsyakshi* (*Alternanthera sessilis*) whole plant powder was extracted with 10ml of alcohol. 3,6 and 9 μ l of the extract was applied on a pre-coated silica gel F₂₅₄ on aluminum plates to a band width of 7mm using Linomat 5TLC applicator. The plate was Ethanol:n-Hexane (1.0:9.0). The developed plates were visualized in short UV , long UV and then derivatization with vanillin sulphuric acid and scanned under UV 254nm, 366nm and 620nm. Rf colour of the spots and densitometry scan were recorded.

RESULTS

Macroscopic: External features of various parts of *Matsyakshi*, i.e leaf, flowers, stem are as shown in figure 1.



Figure 1 Macroscopy of *Alternanthera sessilis*

Microscopic characters: T.S of fresh sample of mature leaf of *A.sessilis* is shown in figure 2a and the enlarged transverse section of leaf (figure 2b) showed the presence of starch grains.

ORIGINAL RESEARCH ARTICLE

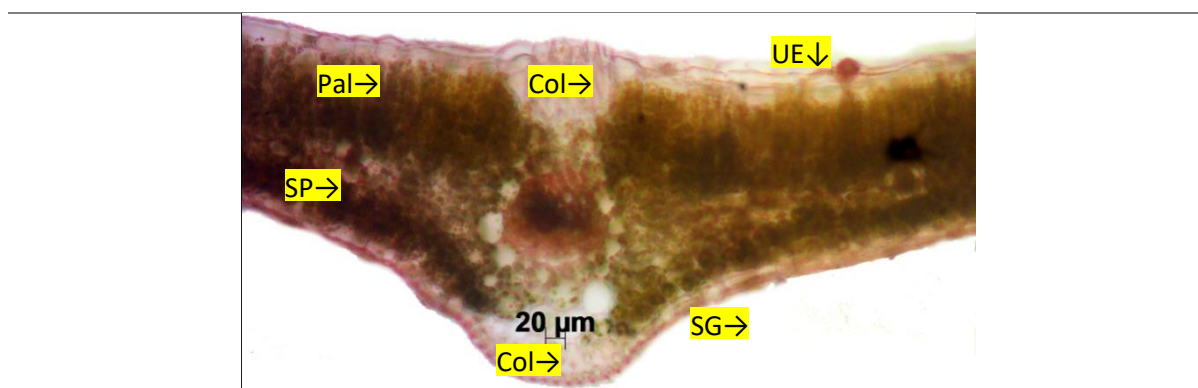


Figure 2a. T.S of Leaf

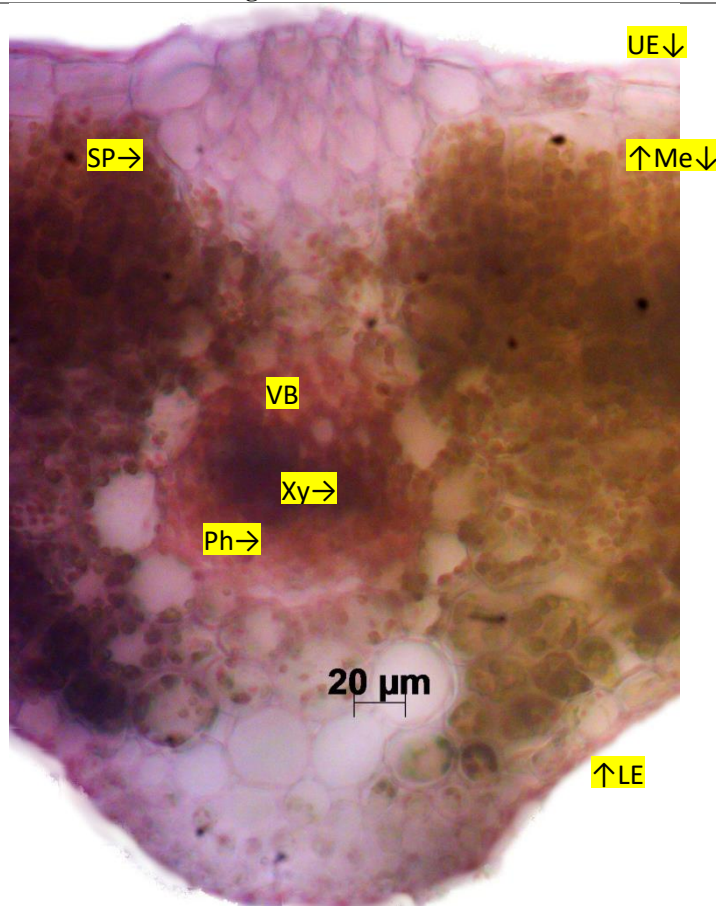


Figure 2b T.S of leaf enlarged

Col – collenchyma; Me – mesophyll; Pal - palisade; Ph – phloem; SG – star-shaped grains; SP – spongy parenchyma; UE – upper epidermis; VB – Vascular bundle; Xy - xylem

The T.S of stem is represented in figure 3a; the enlarged T.S of stem (figure 3b) revealed the presence of trichomes and rostte crystals. Region of cork, cortex and pith is represented in figure 3c, cork and cortex is represented in figure 3d and region of vascular bundle is shown in figure 3e.

The T.S of root is shown in figure 4a and the enlarged T.S of root (figure 4b) showed the presence of primary xylem. Cork and cortex region is represented in figure 4c, vascular bundle (figure 4d) shows the centrally located vascular bundle and figure 4e represents the vascular bundle.

ORIGINAL RESEARCH ARTICLE

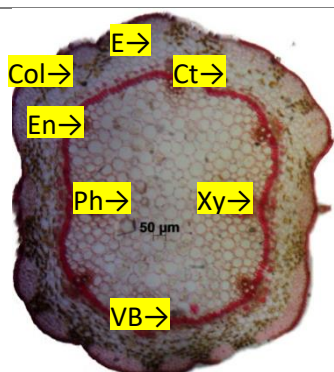


Figure 3a T.S of stem

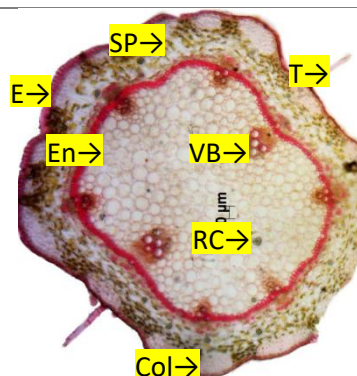


Figure 3b T.S of stem enlarged

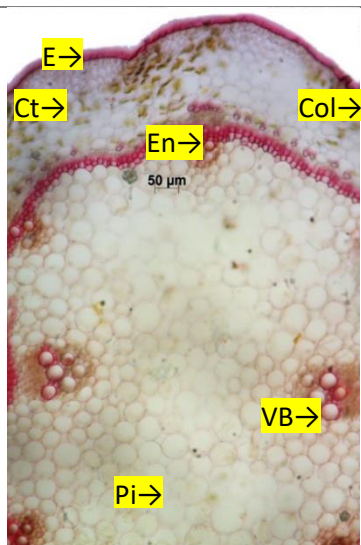


Figure 3c. Cork, cortex, pith

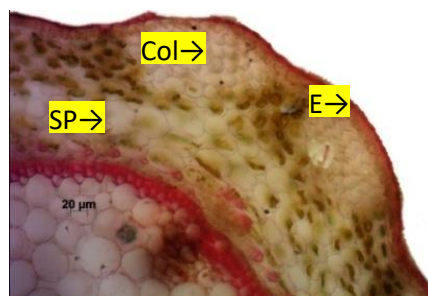


Figure 3d. Cork, cortex

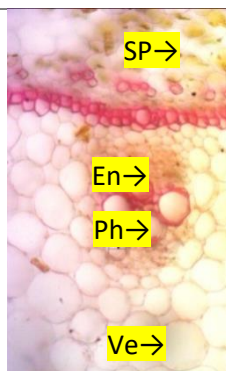


Figure 3e Vascular bundle

Physico-chemical parameters: The process of extraction of alcohol and water soluble extract is represented in the (figure 5) and the results of the

physico-chemical parameters are tabulated in (table 1).

ORIGINAL RESEARCH ARTICLE

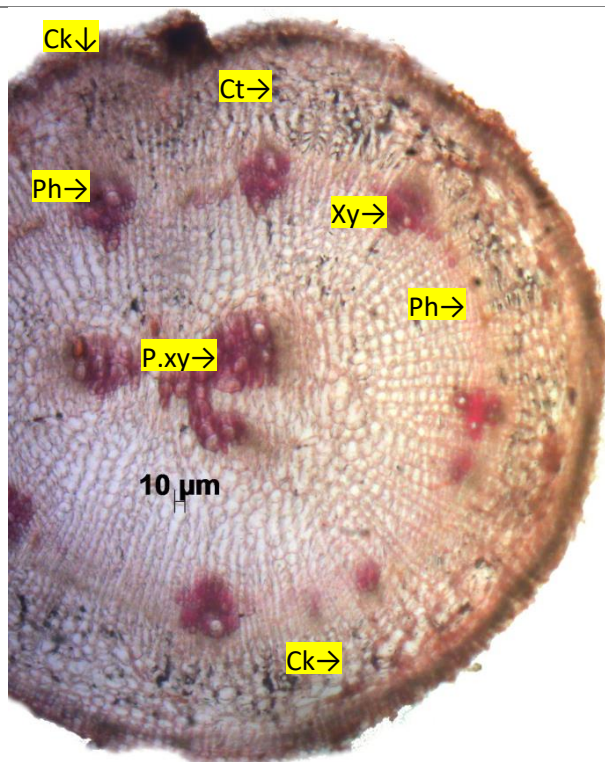


Fig 4a. T.S of root

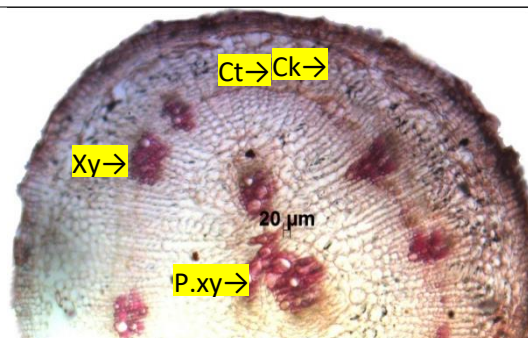


Fig 4b. A portion of T.S enlarged

Fig 4bA portion of T.S enlarged



Figure 5 Process of extraction of alcohol and water soluble extract

Preliminary-Phytochemical screening: For the identification of various plant constituents present in matsyakshi, test for alkaloids, steroids, carbohydrates, tannin, flavanoids, saponins, terpenoids, coumarins, phenols, carboxylic

acid, Amino acids, Resin and Quinone was conducted and the results are as shown in (table 2).

Table 1 Results of standardization parameters of whole plant of *Matsyakshi (Alternanthera sessilis)*

Parameter	Results n = 3 % w/w
Loss on drying	17.54 ± 0.01
Total Ash	16.88 ± 0.64
Acid Insoluble Ash	0.00 ± 0.00
Water soluble Ash	9.54 ± 0.00
Alcohol soluble extractive value	2.94 ± 0.01
Water soluble extractive value	22.77 ± 0.02

Table 2 Results of preliminary phytochemical screening of whole plant of *Matsyakshi (Alternanthera sessilis)*

Test	Inference
Alkaloid	-
Steroid	+
Carbohydrate	-
Tannin	+
Flavanoids	-
Saponins	-

ORIGINAL RESEARCH ARTICLE

Terpenoids	-
Coumarins	+
Phenols	-
Carboxylic acid	-
Amino acids	-
Resin	-
Quinone	-

(+) – present; (-) – negative

HPTLC Analysis: HPTLC bands obtained at short UV, Long UV range and after derivatisation were as in figure 6. R_f values were as in table 3 and densitometry scan was as shown in figure 6a and the R_f values of desitometric scan was shown in table 4.

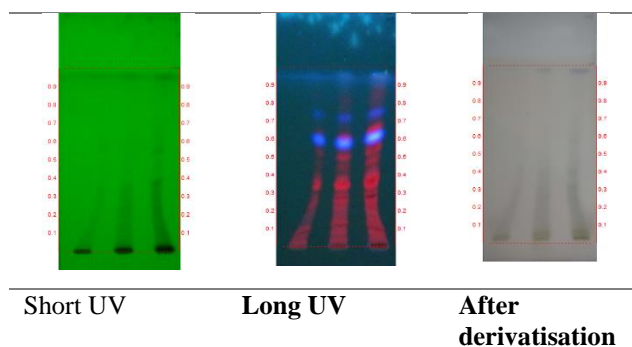


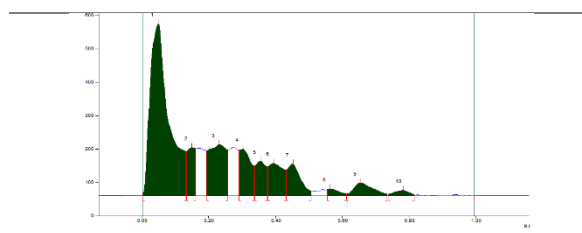
Figure 6 HPTLC Photodocumentation of sample of Alcoholic extract of Matsyakshi (*Alternanthera sessilis* whole plant)

Track 1: Alcoholic extract of Matsyakshi -3μl
Track 2: Alcoholic extract of Matsyakshi -6μl
Track 3: Alcoholic extract of Matsyakshi -9μl
Solvent system: Ethanol: n-Hexane (1:9)

Table 3 R_f values of Matsyakshi

Short UV	Long UV	After derivatisation
-	0.08 (F.red)	-
0.14 (Green)	0.14 (F.red)	-
-	0.26 (F.red)	0.26 (Purple)
0.29 (Green)	0.29 (F.red)	-
-	-	0.31 (Purple)
0.36 (Green)	0.36 (F.red)	-
-	-	0.40 (Purple)
0.45 (Green)	0.45 (F.red)	0.45 (Purple)
-	0.50 (F.red)	-
0.54 (Green)	-	-
-	0.58 (F.blue)	0.58 (Purple)
-	0.62 (F.red)	-
-	0.72 (F.blue)	-
-	0.82 (F.red)	-

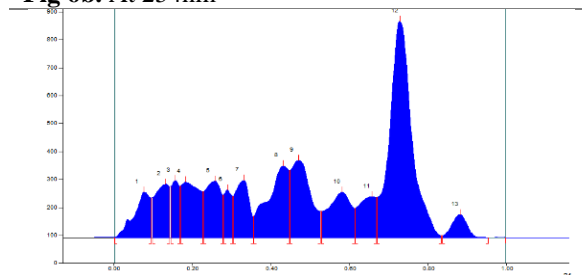
*F-fluorescent



Track 3, ID: Matsyakshi (*Alternanthera sessilis*) whole plant

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	2.4 AU	0.05 Rf	513.0 AU	39.01 %	0.13 Rf	32.0 AU	20717.3 AU	47.89 %
2	0.13 Rf	132.3 AU	0.15 Rf	143.3 AU	10.89 %	0.16 Rf	40.8 AU	2518.9 AU	5.82 %
3	0.19 Rf	134.8 AU	0.23 Rf	151.8 AU	11.55 %	0.26 Rf	36.7 AU	5880.6 AU	13.59 %
4	0.29 Rf	135.3 AU	0.30 Rf	139.1 AU	10.58 %	0.34 Rf	89.0 AU	3468.8 AU	8.02 %
5	0.34 Rf	89.5 AU	0.36 Rf	102.5 AU	7.79 %	0.38 Rf	86.9 AU	2290.2 AU	5.29 %
6	0.38 Rf	87.1 AU	0.40 Rf	98.7 AU	7.38 %	0.43 Rf	76.3 AU	3081.8 AU	7.12 %
7	0.43 Rf	76.9 AU	0.45 Rf	94.4 AU	7.18 %	0.51 Rf	14.7 AU	2710.4 AU	6.27 %
8	0.56 Rf	18.2 AU	0.56 Rf	19.9 AU	1.52 %	0.61 Rf	5.3 AU	496.4 AU	1.15 %
9	0.61 Rf	5.4 AU	0.66 Rf	38.0 AU	2.89 %	0.74 Rf	4.9 AU	1586.1 AU	3.67 %
10	0.74 Rf	4.4 AU	0.78 Rf	16.2 AU	1.23 %	0.82 Rf	3.6 AU	512.6 AU	1.18 %

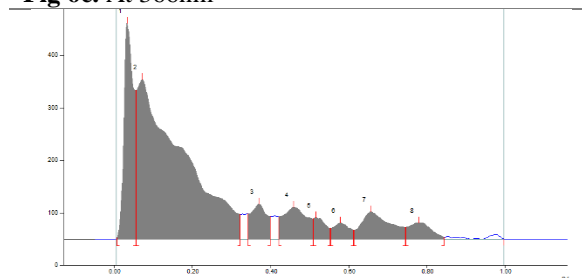
Fig 6b. At 254nm



Track 3, ID: Matsyakshi (*Alternanthera sessilis*) whole plant

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	0.8 AU	0.08 Rf	163.4 AU	5.37 %	0.10 Rf	43.4 AU	4987.6 AU	5.07 %
2	0.10 Rf	143.8 AU	0.13 Rf	191.9 AU	6.30 %	0.14 Rf	82.6 AU	5062.6 AU	5.14 %
3	0.15 Rf	182.9 AU	0.16 Rf	205.5 AU	6.75 %	0.17 Rf	84.8 AU	3105.7 AU	3.16 %
4	0.17 Rf	185.3 AU	0.18 Rf	199.7 AU	6.56 %	0.23 Rf	64.6 AU	6648.9 AU	6.76 %
5	0.23 Rf	164.8 AU	0.26 Rf	203.3 AU	6.68 %	0.28 Rf	52.9 AU	5887.3 AU	5.98 %
6	0.28 Rf	153.7 AU	0.29 Rf	171.7 AU	5.64 %	0.30 Rf	49.0 AU	2416.8 AU	2.46 %
7	0.30 Rf	149.6 AU	0.33 Rf	206.0 AU	6.77 %	0.36 Rf	76.9 AU	5359.5 AU	5.45 %
8	0.36 Rf	78.8 AU	0.43 Rf	257.3 AU	8.45 %	0.45 Rf	41.9 AU	9906.3 AU	10.06 %
9	0.45 Rf	242.2 AU	0.47 Rf	277.2 AU	9.10 %	0.53 Rf	95.0 AU	9876.8 AU	10.03 %
10	0.53 Rf	95.0 AU	0.58 Rf	163.5 AU	5.37 %	0.61 Rf	06.0 AU	6914.9 AU	7.03 %
11	0.62 Rf	106.3 AU	0.66 Rf	146.8 AU	4.82 %	0.67 Rf	45.1 AU	4557.2 AU	4.63 %
12	0.67 Rf	145.4 AU	0.73 Rf	774.7 AU	25.44 %	0.84 Rf	8.0 AU	31341.3 AU	31.84 %
13	0.84 Rf	8.1 AU	0.88 Rf	83.7 AU	2.75 %	0.95 Rf	0.0 AU	2362.3 AU	2.40 %

Fig 6c. At 366nm



Track 3, ID: Matsyakshi (*Alternanthera sessilis*) whole plant

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.01 Rf	2.3 AU	0.03 Rf	410.2 AU	41.12 %	0.05 Rf	82.3 AU	7146.5 AU	16.52 %
2	0.06 Rf	282.7 AU	0.07 Rf	303.6 AU	30.44 %	0.32 Rf	47.6 AU	25520.3 AU	58.99 %
3	0.34 Rf	47.8 AU	0.37 Rf	66.7 AU	6.69 %	0.40 Rf	43.2 AU	1952.5 AU	4.51 %
4	0.42 Rf	42.7 AU	0.46 Rf	61.1 AU	6.13 %	0.51 Rf	38.9 AU	2747.5 AU	6.35 %
5	0.51 Rf	39.3 AU	0.52 Rf	41.0 AU	4.11 %	0.55 Rf	20.5 AU	892.5 AU	2.06 %
6	0.55 Rf	20.6 AU	0.58 Rf	31.4 AU	3.15 %	0.61 Rf	17.2 AU	918.4 AU	2.12 %
7	0.61 Rf	17.2 AU	0.66 Rf	51.8 AU	5.20 %	0.75 Rf	22.7 AU	2756.3 AU	6.37 %
8	0.75 Rf	22.9 AU	0.78 Rf	31.6 AU	3.17 %	0.85 Rf	3.8 AU	1325.7 AU	3.06 %

Figure 6e At 620nm

ORIGINAL RESEARCH ARTICLE

Table 4 R_f values by Densitometric scan *Matsyakshi* (*Alternanthera sessilis*)

At 254nm	At 366nm	At 620nm
-	-	0.03
0.05 (47.89)	-	-
-	0.08×	0.07 (58.99) ×
-	0.13×	-
0.15	0.15	-
-	0.18 (6.76)	-
0.23 (13.59)	-	-
-	0.26×	-
0.30×	0.29×	-
-	0.33	-
0.36	-	0.37
0.40 (7.12) ×	-	-
-	0.43 (10.06)	-
0.45 (6.27) ×	-	0.46 (6.35) ×
-	0.47 (10.03)	-
-	-	0.52
0.56	-	-
-	0.58 (7.03) ×	0.58×
0.66	0.66	0.66 (6.37)
-	0.73 (31.84) ×	-
0.78	-	0.78
-	0.88	-

DISCUSSION

Matsyakshi is well explained during the nighantu kala. It acts as *kapha pittahara*, *shothahar*, *kushtaghna*, *chakushya*, *rasayana*, *vrana lekhana*. It exhibits various pharmacological activities like anti-diabetic, anti-microbial, wound healing, antiasthmatic, Hepato-protective and Nootropic activity, these activities are proved through various experimental studies. It is extensively used among the traditional practitioners for various ailments such as skin disorders, as blood purifier, cut wounds and also as a vegetable in food preparations. with no characteristic odour and taste. The smooth and shiny texture of the leaves indicates the predominance of *jalamahabhoota*. The flowers are white in colour and sessile.

Microscopy: Carbohydrate is stored as starch grains which serve as reserve food. There is presence of rosette crystals are present in the transverse section of the stem which is unique to this plant. These rosette crystals are a type of calcium oxalate crystals, they are inorganic crystalline compounds by their specific shape, it can be utilized for the identification of the herbal drugs. Hence it considered as diagnostic character of the plant. Trichomes are considered as the diagnostic characters that help in the identification of the genuine source of the plant.

Macroscopy: The leaves of *A.sessilis* are sessile Trichomes are usually present in the aerial parts of the plant, as such they are functionless, but sometimes they excrete water and perform secretory function.

Physico-chemical parameters: Loss on drying- 17.54 ± 0.01; Total Ash 16.88 ± 0.64; Acid Insoluble Ash-0.00 ± 0.00; Water soluble Ash- 9.54 ± 0.00; Alcohol soluble extractive value-2.94 ± 0.01; Water soluble extractive value-22.77 ± 0.02. Thus these parameters help in standardization and also help in obtaining the genuine source of the plant. Total ash is out of specified limit for the crude drug it is probably because water insoluble ash which is due to the physiology of the plant may be imbibed due to seasonal variations, adverse climatic conditions, topography etc. Through total ash content was out of specified limit it is safe for therapeutic use because acid insoluble ash which is responsible for determination of siliceous earthy matter, present on roots, rhizomes, and also on the leaves. This

ORIGINAL RESEARCH ARTICLE

acid insoluble ash is nil which is considerably good. This suggests that the crude drug is safe for human consumption.

Phytochemical parameters: The phytochemical parameters revealed the presence of steroids, tannins, which are anti-inflammatory in action and coumarins have anti-oxidant, analgesic and immune-modulation activity.

HPTLC: HPTLC profile showed 5 peaks with R_f 0.14(Green), 0.29(Green), 0.36(Green), 0.45(Green), 0.54(Green) in the short UV range. 11 bands with R_f values 0.08(F.red), 0.14(F.red), 0.26(F.red), 0.29(F.red), 0.36(F.red), 0.45(F.red), 0.50(F.red), 0.58(F.blue), 0.62(F.red), 0.72(F.blue), 0.82(F.red) in long UV range. After derivatization 5 bands were noted 0.26(purple), 0.31(purple), 0.40(purple), 0.45(purple), 0.58(purple).

Densitometry scan showed 10 peaks with R_f values 0.05(47.89), 0.15, 0.23, 0.30, 0.36, 0.40(7.12), 0.45(6.27), 0.56, 0.66, 0.78 at 254nm. 13 peaks with R_f values 0.08, 0.13, 0.15, 0.18, 0.26, 0.29, 0.33, 0.43(10.06), 0.47(10.03), 0.58(7.03), 0.66, 0.73(31.84), 0.88 at 366nm. 8 peaks with R_f values 0.03, 0.07, 0.37, 0.46(6.35), 0.52, 0.58, 0.66(6.37), 0.78 at 620nm.

CONCLUSION

The determination of the phyto-chemical constituents, physico-chemical parameters, HPTLC of the medicinal plants helps us in standardization of the plant and also in obtaining the genuine source of the plant species. The

screening of phytochemical constituents helps us to determine the pharmacological activities of plant. These pharmacological activities are proved through various experimental models and thus bring a new candidate drug for the clinical trial and for human consumption. The presence of rosette crystals, trichomes shows the unique and diagnostic feature of the plant that helps in identification and standardization of the drug. The phytochemical constituents of *Alternanthera sessilis* revealed the presence of steroids, tannins and coumarins. These phytochemical constituents exhibit anti-inflammatory, analgesic, anti-oxidant and immuno-modulation activities. HPTLC profile showed 5 peaks in short UV range, 11 peaks in long UV range, 5 bands were noted after derivatization. In coming days an attempt could be made in compound isolation in its pure form to determine the phytoconstituent, its structural elucidation and identification which could serve as benchmark.

ORIGINAL RESEARCH ARTICLE

REFERENCES

1. Agnivesha. (2015). Charaka samitha. In Charaka, Dridhabala, & J. Trikamji acharya (Ed.), Sutrasthana (p. 20). Varanasi: Chaukhambha publications.
2. Agrawal, S., & Paridharvi, M. (2017). Herbal Drug Technology. Hyderabad: Universities Press Private Limited.
3. Hereman, S. (1868). Paxton Botanical Dictionary. New Delhi : Periodical experts book agency .
4. Gopalkrishna, B. K. (2014). Flora of South Kanara. Udupi: K Gopalkrishna Bhat, Retd Profssor, Srinivasa Nagara, Chitpady, Udupi.
5. Subramanya, K., & Raveendran, K. (2012). In Exploration and Elucidation of Traditional medicinal plant of Erstwhile Tulunadu ans srrounding area of Kerala and Karanataka. Kannur: Department of P.G. Studies and Research in Botany, Sir Syed College-Talaparambha, Kannur University.
6. Bhavamishra. (2010). Bhavapraksha Nighantu. (G. S. Pandey, & K. C. Chunekar, Eds.) Varanasi: Chaukhambha Bharati Academy.
7. GopalKrishna, B. K. (2014). Flora of Udupi . Udupi : K Gopakkrishna Bhat, Retd Professor, Srinivasa Nagara, Chitpady, Udupi, Karanataka.
8. Ayurvedic Pharmacopoeia of India. (2003). New Delhi : Govt of India ministry of Health and welfare.
9. Chandrashekar, K. (2019). Enthobotanical and Phytochemical overview of Matsyakshi(*Alternanthera sessilis* R.Br.ex.DC.Journal of Ayurveda and herbal medicine , 152-155.