



Pharmacognostic Study of *Justicia beddomei* (C. B. Clarke) Bennet

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Authors' contributions

This work was carried out in collaboration among all authors. Author VD designed this work. Author CH collected, identified and authenticated this plant. Authors ANS and VD managed the analyses of the study, managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Justicia beddomei (C. B. Clarke) Bennet synonym *Adhatoda beddomei* C.B. Clarke consists of the fresh or dried leaves. Dried leaves are of a dull brownish-green colour, characteristic odour and bitter taste. The leaves of the plant contain major alkaloids called vasicine, vasicinone and deoxyvasicinone, sitosterol and its glucoside, which are shown to be having bronchodilator and antihistaminic effects. These alkaloids are said to exist in combination with an acid that has been named adhatodic acid. Leaves yield essential oil and an alkaloid vasicine. Roots contain vasicinol and vasicinone. Roots also contain vasicoline, adhatodine, anisotine and vasicolinone. Several alkaloids like quinazoline and valicine are present in this plant. The leaf extracts of *Justicia beddomei* (C. B. Clarke) Bennet is used as an expectorant especially in chronic bronchitis and asthma. It relieves cough and breathlessness. It is also prescribed commonly for local bleeding due to peptic ulcer, piles etc. Its local use gives relief in pyorrhoea and in bleeding gums. In the present study, detailed Pharmacognosy of this plant is studied as it is used as substitute for *Adathoda vasica*.

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1. INTRODUCTION

Justicia beddomei (C. B. Clarke) Bennet Synonym *Adathoda beddomei* C. B. Clarke belongs to family Acanthaceae. *Adhatoda* is a genus of stout shrubs, distributed throughout the tropical regions of Asia, Africa and America. *Adhatoda* is a medicinal plant of common occurrence in Kerala. It is a profusely branching shrub growing up to a height of 1.5 m. Three species occur in India and two are medicinally important viz., *Adhatoda vasica* (*Valiya adalodakam*) and *Justicia beddomei* (C. B. Clarke) Bennet (*Chittadalodakam oru cheriya adalodakam*). *Chittadalodakam* is medicinally important species mostly seen in Kerala. Leaves and roots of this species are of main ingredients of many ayurvedic preparations. Leaves contain an alkaloid *vasicine*, which is effective against cough, chronic bronchitis, asthma etc. It is well known in the indigenous systems of medicines for bronchitis. It is cultivated for medicinal uses, fencing, manure and as an ornamental potted plant also.

1.1 Origin and Distribution

This species is endemic to India occurring in the Travancore hills of South Western Ghats, Valparai (South Arcot), Akkamalai (Coimbatore Dist.) and Mahendragiri (Kanyakumari Dist.) [1,2].

1.2 Threat Status

This species was earlier assessed as "Critically Endangered". Owing to its threat status, it might however be beneficial to have more taxonomical, ecological, genetic and chemical investigations to confirm any controversies on the species identity.

1.3 Collection, Identification and Authentication

Justicia beddomei (C. B. Clarke) Bennet differs from *Adhatoda vasica* in color and size of leaves. It is a large glabrous shrub. The leaves are white-green and smaller in case of *J. beddomei*, while leaves of *A.vasica* are bigger in size and blackish green in color. *J. beddomei* is a medium-sized shrub with swollen nodes, 1-2 m in height, with large, deep roots, pale brown bark;

broad, oblong-lanceolate or elliptic-lanceolate, 12.5-18 cm long opposite leaves and white flowers in dense, bracteate spikes, small and turns black on drying. The flowering season is throughout the year. Fruits are capsules with a long solid base. Recent molecular studies consider it congeneric with *Justicia* L. [3]

2. MATERIALS AND METHODS

Voucher specimen: The plant material, the leaves of *Justicia beddomei* was collected from the wild and Identity was confirmed with the voucher specimen using Gamble [4].

The leaves of *Justicia beddomei* thus collected are shade dried, powdered and extracted using Soxhlet extractor by Ethanol (95%).

Physico-chemical values such as the percentage of total ash, acid insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian pharmacopoeia Anonymous [5]. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian Pharmacopoeia Anonymous [5]. TLC fingerprinting profile carried as per Stahl [6]. For the Anatomical studies, transverse sections (TS) were prepared and stained Johansen [7]. A standard, Limit for total microbial count provided by WHO Guidelines [8] was followed and also Indian herbal pharmacopoeia [9,10,11].

3. RESULTS AND DISCUSSION

3.1 Physicochemical and Organoleptic Parameters

The limits are not mentioned for the plant under study either in Indian Herbal Pharmacopoeia or in Ayurvedic Pharmacopoeia of India. It is reported for the first time (Table 1).

3.2 TLC Finger Printing Profile

In *A. beddomei* prominent, band compared with *Vasicine* Phytochemical Standard was observed at Rf values 0.68 where the corresponding band was observed in test sample with the Rf value of 0.68 after sprayed with Dragendorff's reagent. Three and two bands were observed under long and short UV respectively (Plate 1 and Table 2).

Table 1. Indicating physicochemical and organoleptic characters

Physicochemical constants			Organoleptic characters	
Parameters	Values	Limit	Parameters	Properties
TA	13.05%	NA	Taste	Bitter
AIA	00.95%	NA	Color	Cream
ASE	5.9%	NA	Odour	Characteristic
WSE	24.0%	NA	Texture	Fine

TA - Total Ash; AIA - Acid Insoluble Ash; ASE - Alcohol Soluble Extractive; WSE - Water Soluble
NA-Not Available

Table 2. Showing Rf values of the bands

1. Sprayed with dragendorff's reagent								
Rf Values	0.68	-	-	-	-	-	-	-
2. Vasicine Phytochemical Standard								
Rf Values	0.68	-	-	-	-	-	-	-
3. Under Short UV (254 nm) Sample								
Rf Values	0.51	0.78						
4. Vasicine Phytochemical Standard								
Rf Values	0.68	-	-	-	-	-	-	-
5. Under Long UV (366 nm) Sample								
Rf Values	0.39	0.69	0.85					
6. Vasicine Phytochemical Standard								
Rf Values	0.44	0.69						

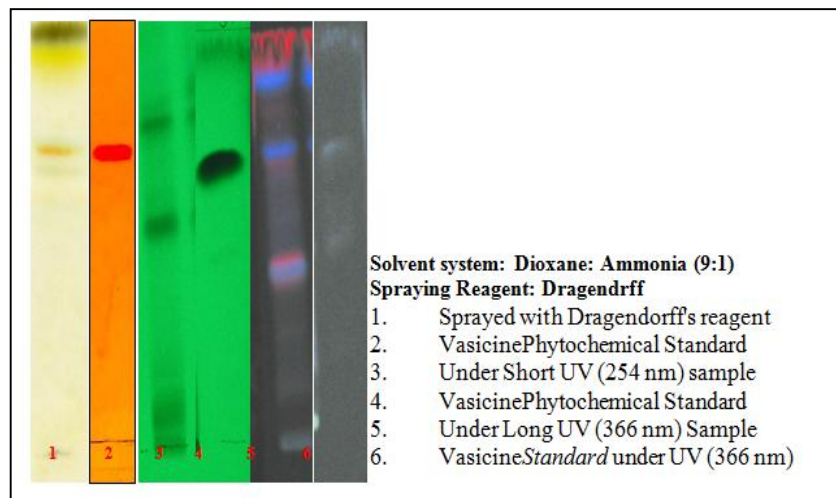


Plate 1. TLC finger printing profile of *Justicia beddomei* (C. B. Clarke) Bennet (Leaf) histological studies

Salient features of T. S. of *Justicia beddomei* (C. B. Clarke) Bennet (Leaf): Plate 2 and Plate 3 are explained in detail as below

1. T.S of leaf shows round in shape at midrib region, (Fig. 1)
2. Single layered epidermal cells on both side upper and lower with thin cuticle, (Figs. 3,4 & 5)
3. Bellow epidermal region three to four layers of hypodermal cells, which are collenchymatous, (Fig. 2).
4. Transverse section of leaf shows, dorsiventral surface with two layers of palisade cells and layers of spongy parenchyma cells, (Figs. 6 & 7)
5. In midrib region crescent shaped vascular bundle present, and towards lamina region

- small vascular bundles are situated in each side of lamina region, (Fig. 8)
6. Protoxylem and metaxylem cells are present at the center, (Fig. 9)
 7. Phloem cells are present above and below the xylem cells, (Fig. 10)
 8. Glandular trichomes, starch grains and oil glands were absent.

3.3 Microbial Limit Test

Limits referred by WHO guidelines [8], Indian Herbal pharmacopoeia [9]. Total aerobic bacterial count (TABC): $\leq 1 \times 10^7$ & total yeast and mould count (TYMC): $\leq 1 \times 10^5$.



Fig. 1. Whole view of T. S leaf

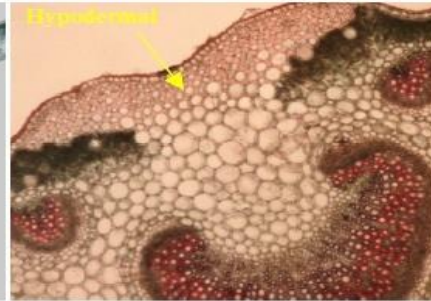


Fig. 2. Mid rib region

Anatomical studies of leaf

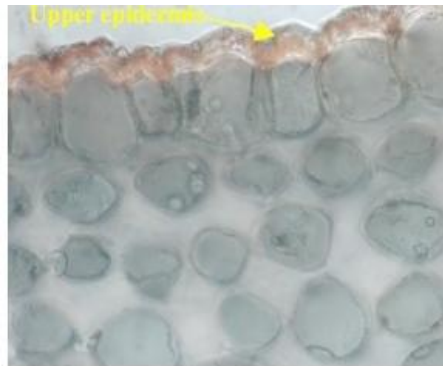


Fig. 3. Upper epidermis

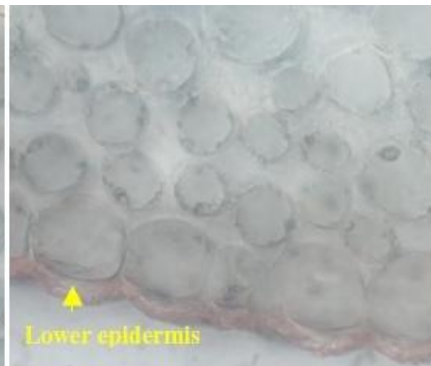


Fig. 4. Lower epidermis

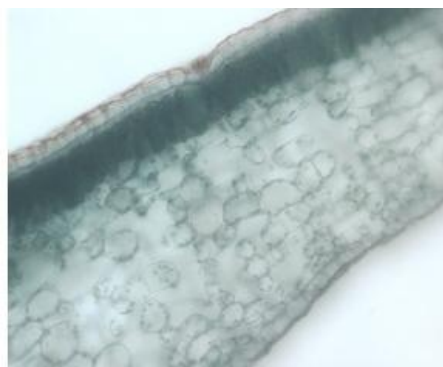


Fig. 5. Lamina region



Fig. 6. Palisade parenchyma

Plate 2. T. S of *Justicia beddomei* (C. B. Clarke) Bennet (Leaf)

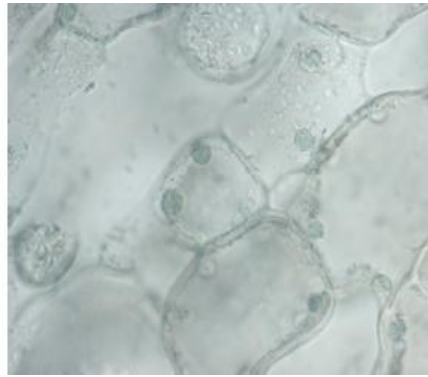


Fig. 7. Spongy parenchyma



Fig. 8. Vascular bundle

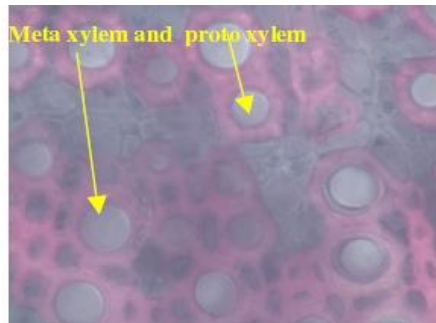


Fig. 9. Xylem cells

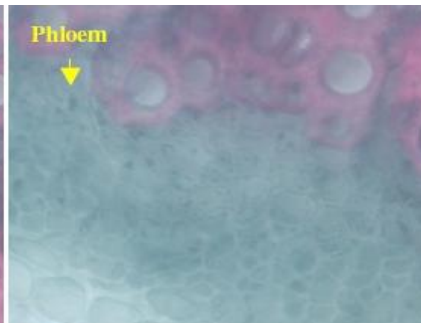


Fig. 10. Phloem cells

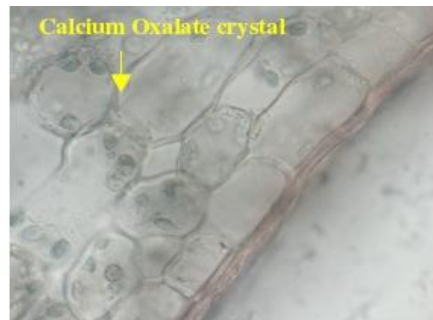


Fig. 11. Calcium oxalate crystals



Fig. 12. Parenchyma cells

Plate 3. T. S. of *Justicia beddomei* (C. B. Clarke) Bennet (Leaf)

Table 3. Showing microbial limits for *Adathoda beddomei*

Raw herb sample	Total aerobic bacterial count (TABC) (Cfu/gm)	Total yeast and mould count (TYMC) (Cfu/gm)
<i>Adhatodabeddomei</i>	1×10^4	7.9×10^4

Results of microbial assay of *Justicia beddomei* (C. B. Clarke) Bennet showed 10,000 colonies for aerobic bacteria and 79,000 colonies (Table 3), which are below the limits of international guidelines.

4. CONCLUSION

From the present study we can conclude that the Physicochemical tests were done for the first time for *Justicia beddomei* (C. B. Clarke) Bennet

where as for *Adathoda vasica* there limits mentioned in IHP and API. The extract was subjected to TLC studies and it showed the presence of Vasicine at Rf Value .68-.69 both in standard sample as well as test sample. The Histological studies revealed that characters are unique and will help in identifying genuine drug. The microbial limit tests indicated that the sample under study TABC &TYMC is well within the range of norms mentioned by WHO guidelines [8].

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Joy PP, Thomas J, Mathew S, Skaria BP. Medicinal plants. Tropical Horticulture. (eds. Bose TK, Kabir J, Das P, Joy PP.). Naya Prokash, Calcutta. 2001;2:449-632.
2. Ved DK, Anjana Mudappa, Archana Singh and Photos by Dr. Ravikumar K, Trade Status of Commercially Important Medicinal Plant Species of the Project Area of Andhra Pradesh Community Forest Management Project., Prepared For Andhra Pradesh Forest Department Foundation For Revitalization of Local Health Traditions (FRLHT); 2002.
3. Yoganarasimhan SN. (Assisted by V. Chelladurai). Medicinal Plants of India. Regional Research Institute (Ayurveda). 2000;2:21-22.
4. Gamble JS. Flora of the presidency of madras. Newmann and Adlard London West. 1935;1-3.
5. Anonymous. The Wealth of Asia. A Compact Disc – Alphabet A. Council of Scientific and Industrial Research (CSIR), New Delhi; 1998.
6. Stahl E. Thin layer chromatography, Springer International Student Edition New York; 1965.
7. Johansen DA. Plant microtechnique. McGraw-Hill, New York. 1940;523.
8. WHO. Quality Control methods for Medicinal Plant materials, WHO, Geneva. 1998;22.
9. Indian drug Manufacturers' Indian herbal pharmacopoeia, Indian drug Manufacturers' Mumbai; 2002.
10. Wallis TE. Text book of pharmacognosy, Fifth Edition, CBS Publication and distributors. 1957;389-396.
11. WHO. The ayurvedic pharmacopoeia of India. Ministry of Health and Family welfare, Govt. of India. 2001;1-4.

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