

ISSN: 2395-4108



Abrahamia

An International Journal of Plant Sciences



Terminalia bialata

VOLUME 8 • NUMBER 1 • 2022



DEPARTMENT OF BOTANY, UNIVERSITY OF KERALA
Kariavattom, Thiruvananthapuram, Kerala, India - 695581

Abrahamia

An International Journal of Plant Sciences

EDITORIAL BOARD

Chief Editor

Prof. (Dr.) Bindu R. Nair, *Dept. of Botany, University of Kerala.*

Editorial Board

Dr. E.A. Siril, *Dept. of Botany, University of Kerala*

Dr. P. M. Radhamany, *Dept. of Botany, University of Kerala*

Dr. Suhara Beevy S., *Professor (Retd.), Dept. of Botany, University of Kerala*

Dr. A. Gangaprasad, *Professor (Retd.), Dept. of Botany, University of Kerala*

Dr. Swapna T. S., *Dept. of Botany, University of Kerala*

Dr. R. Rajalakshmi, *Dept. of Botany, University of Kerala*

Dr. Shiburaj S., *Dept. of Botany, University of Kerala*

Dr. George Thomas, *Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram*

Dr. Anitha Karun, *Biotechnology Section, Central Plantation Crops Research Institute, Kasargod*

Dr. Gireesh, *Rubber Research Institute India, Kottayam, Kerala*

Dr. Hugo Volkaert, *Centre for Agricultural Biotechnology, Kasetsart University-Pathom, Thailand*

Dr. Jasmine M Shah, *Department of Plant Science, Central University of Kerala, Kasaragod*

Dr. Joe Chappell, *University of Kentucky, Lexington, KY*

Dr. M. K. Janarthanam, *Department of Botany, Goa University, Goa*

Dr. M. N. Premachandran, *Division of Crop Improvement, Sugarcane Breeding Institute, Coimbatore, TN*

Dr. Madan Thankavelu, *Cancer Cell Unit & Department of Oncology, University of Cambridge, UK*

Dr. P. G. Latha, *Former JNTBGRI, Palode, Trivandrum*

Dr. Pat Heslop Harrison, *University of Leicester, U.K.*

Dr. Uppeendra Dhar, *University School of Environment Management, GGS Indraprastha University, Delhi*

Dr. V. Rama Koti Reddy, *Professor, Department of Botany, Bharathiar University, Coimbatore*

Dr. V. Saransan, *Royal Botanic Garden, Kew, U.K.*

Dr. A.G. Pandurangan, *Former Director, JNTBGRI, Palode*

Dr. Murugan K., *Principal (Retd.), Govt. Arts College, Thiruvananthapuram*

Dr. K. B. Rameshkumar, *JNTBGRI, Palode*

Dr. Santhosh Nampy, *Dept. of Botany, University of Calicut*

Dr. B. R. Reghunath, *Dept. of Biotechnology, College of Agriculture, Vellayani, Thiruvananthapuram*

Dr. A. K. Pradeep, *Dept. of Botany, University of Calicut*

Dr. K. Manoharan, *Department of Plant Morphology and Algology, School of Biological Sciences, Madurai Kamaraj University*

Dr. Sam P. Mathew, *Principal Scientist (Retd.), JNTBGRI, Palode*

Editorial Assistants

Sreeja Parvathy, Vijaya Lekshmi M R

Anju H, Renju R, Priyanka M S

Mohamed Safvan V K, Arsha K

Department of Botany, University of Kerala

©

Printed and Published by

Head

Department of Botany, University of Kerala, 2022

Cover Photo: Dr. Mehtab Jahan Bukhari

Cover Design & Layout: Godfrey's Graphics, 9447451314

Printed at: University Press, Palayam Campus, University of Kerala

Abrahamia

An International Journal of Plant Sciences

VOLUME 8

NUMBER 1

2022



DEPARTMENT OF BOTANY, UNIVERSITY OF KERALA
Kariavattom, Thiruvananthapuram

CONTENTS

ARTICLES

Review of the genus *Asystasia* Blume (Acanthaceae)

Viswakumar Sujatha Deepa Lekshmi, Venugopalannair Saradamma Anil Kumar 05

Assessment of growth parameters of micro forest Miyawaki garden in Kariavattom Campus, Thiruvananthapuram

Mohamed Safvan V. K. & Swapna T. S. 15

Pharmacognostical evaluation of leaves of *Justicia adhatoda* L. and *Justicia beddomei* (C.B Clarke) Bennet.

Rajalakshmi R., Prasanth M. K. and Shilpa K. S. 25

PHOTO FEATURE

***Terminalia bialata* (Roxb.) Steud.**

Sam P. Mathew & A. Gangaprasad 31

Pharmacognostical evaluation of leaves of *Justicia adhatoda* L. and *Justicia beddomei* (C.B Clarke) Bennet.

R Rajalakshmi*, Prasanth M K and Shilpa K S

Department of Botany, University of Kerala, Kariavattom, Thiruvananthapuram-695581

*Corresponding author: rajalakshmi.murali@gmail.com

Abstract

Justicia adhatoda and *Justicia beddomei* are the two species belongs to Acanthaceae, has been widely used as medicine. *Justicia adhatoda* is commonly known as Vasaka or Malabar nut. *Justicia beddomei* is a rare evergreen shrub with restricted distribution at an elevation of 1000 m in the hills of South Travancore in Southern Indi. In the present study Pharmacognostic evaluation and physico-chemical analysis were carried out in *Justicia adhatoda* and *Justicia beddomei*. Micro and macro morphological analysis revealed the major morphological features that help in distinguishing these two species. Physicochemical analysis indicated that *Justicia beddomei* contain less impurities and more medicinal value as compared to *Justicia adhatoda*.

Key words: Acanthaceae, *Justicia adhatoda*, *Justicia beddomei*, Pharmacognosy

Introduction

Medicinal plants which form the backbone of traditional medicine have been the subject of intense pharmacological studies in the last few decades. Secondary metabolites are used economically important values especially as drugs, flavors, fragrances, insecticides and dyes by human beings. But there is a need to confer

the safety, efficacy and stability of these drugs obtained from plants. In this case, the anatomic study of pharmacologically useful plants may contribute to quality assurance and correct identification (Mauro et al., 2008). So, the preliminary pharmacological analysis is essential as part of developing drugs. In this regard, the present investigation has aimed in determining the pharmacognostical standardization in leaves of two species; *J. adhatoda* and *J. beddomei*.

Justicia adhatoda is grown throughout India especially in the lower Himalayan regions. It is a perennial, evergreen and highly branched shrub (1.0 m to 2.5 m height) with unpleasant smell and bitter taste. The plant has potent anti-periodic, astringent, diuretic and purgative action. It is used in the treatment of respiratory diseases like asthma, cough, bronchitis and tuberculosis. The flowers, leaves and root have antispasmodic property. For instance, the source of the drug vasaka is well known in the indigenous system of medicine for its beneficial health effects, particularly in treating bronchitis. This study provides scientific proof on the use of these plants which are being utilized traditionally as herbal medicines. (Jayapriya and Shoba, 2015).

Justicia beddomei is an important source of the drug vasaka in the indigenous of medicine (Aiyer

and Kolamall, 1963), where it is considered therapeutically superior to the allied species, *Justicia adhatoda*. This plant has medicinal uses, mainly antispasmodic, fever reducer, anti-inflammatory, anti-bleeding, bronchodilator, antidiabetic, anthelmintic, disinfectant, anti-jaundice, antiseptic, oxytoxic and expectorant and has many other medicinal applications (Patel and Bhatt, 1984, Chakraborty and Brantner, 2001). Thus, the present study focuses on the pharmacognostical standardization of the leaves from *Justicia adhatoda* and *Justicia beddomei*.

Materials and Methods

Collection and authentication of plant material

Fresh leaves of *Justicia adhatoda* was collected from Kollad, Kottayam (9.559° N; 76.538° E) and *Justicia beddomei* from Pattikad, Thrissur (11.006° N; 76.190° E) and maintained in the green house, Department of Botany, University of Kerala, Kariavattom (Fig.1). The botanical identities were verified by the Curator, Department of Botany, University of Kerala; taxonomical features were critically studied and confirmed with the Flora of the Presidency of Madras and with other relevant available literatures. A voucher specimen was maintained at the Herbarium, Department of Botany, University of Kerala.

Pharmacognosticevaluation

Pharmacognostic studies of the present investigation focused on macro-morphological and microscopic evaluation of fresh leaves. The macro-morphological evaluation was based on determining sensory parameters, shape, size, apex, margin and venation. On the other hand, the microscopic evaluation of leaf was conducted on both qualitative (anatomical sections) and quantitative grounds including determining specific leaf area.

Physico-Chemical evaluation

In physicochemical evaluation, moisture content, pH, ash values, extractive values were determined (Indian Pharmacopoeia, 2010; Kokate, 2003; Indian Pharmacopoeia, 1996). Along with this, the powdered leaves were also subjected to treat with different chemical reagents. The information collected from these tests was used for standardization and obtaining the quality standards (WHO, 1998; Indian Pharmacopoeia, 1996).

Loss on drying percentage =

$$\frac{\text{loss in weight of the sample}}{\text{weight of the sample in gm}} \times 100$$

Results and Discussion

Evaluation of leaf morphology

Justicia adhatoda, an evergreen, gregarious perennial shrub, 1.2 to 6 m in height, Leaves are elliptical lanceolate or ovate lanceolate in shape, entire, crenate margin and symmetric base, 5-30 cm long, hairy, light green in colour at the upper surface and dark green in colour at the lower surface with characteristic odour. *Justicia beddomei*, a glabrous shrub of 1 to 3 m in height, leaves are simple, entire, wavy, ovate lanceolate in shape, attenuate at base and acuminate apex, 6 to 14 cm long and 3 to 4.5 mm broad with prominent midrib at the lower surface (Fig:1).

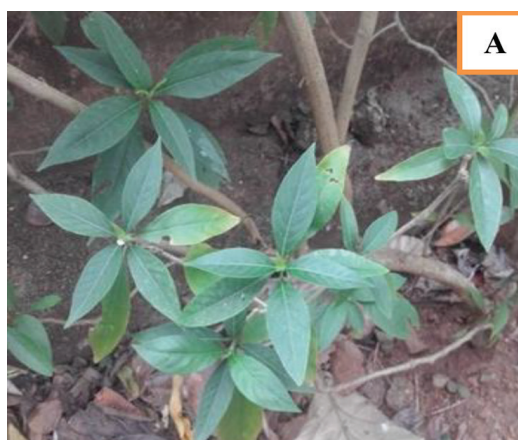


Fig: 1 A-Habit of *Justicia beddomei*



B- Habit of *Justicia adhatoda*

The macro morphological evaluation of leaves revealed that *Justicia adhatoda* is having simple leaves with opposite arrangement. The leaf base and leaf apex are acute. The leaves are dark

green in colour with upper smooth and lower rough surface. In *Justicia beddomei*, leaves are simple with alternate whorled arrangement. Base of the leaf is acute and leaf apex attenuates. In both species leaf margins are entire, non-serrated and having bitter taste. The quantitative results of both the species of *Justicia* were summarized in Table 1.

Table 1
Quantitative data of *Justicia adhatoda* and *Justicia beddomei*

Parameters	<i>Justicia beddomei</i>	<i>Justicia adhatoda</i>
Length of leaf (cm)	12.76±0.88	18.5±0.28
Breadth of leaf(cm)	3.8±0.11	5.46±0.24
Length of petiole(cm)	1.33±0.44	1.9±0.05
Breadth of petiole(cm)	0.133±0.088	0.19±0.02
Number of veins	8±0.00	13±0.57
Base angle of leaf(cm)	107±0.51	119.6±0.33
Apex angle of leaf(cm)	101.1±0.14	109.6±0.33
Leaf area(cm ²)	48.7±0.68	101.03±0.55
Length to breadth ratio of leaf	3.32±0.14	3.39±0.20
Length to breadth ratio of petiole	9.85±0.23	10.16±0.76

*Data taken as triplicates and represented as mean ±standard error

Organoleptic evaluation of leaf and leaf powder

Organoleptic evaluations of leaf and leaf powder were carried out. The results revealed that, leaf of *J. adhatoda* are dark green in colour than *J. beddomei*. The leaf of *J. beddomei* exhibited characteristic odour. The results of the same are summarized in Tables 2 and 3.

Table 2
Organoleptic evaluation of leaf of *Justicia adhatoda* and *Justicia beddomei*

Plant	Colour of leaf	Odour	Taste	Texture
<i>J. adhatoda</i>	Upper: Light Green Lower: Dark Green	No characteristic odour	Bitter	Rough
<i>J. beddomei</i>	Upper: Pale Green Lower: Light Green	Characteristic odour	Bitter	Smooth

Table 3
Organoleptic evaluation of leaf powder of *Justicia adhatoda* and *Justicia beddomei*

Plant	Colour	Odour	Taste	Texture
<i>J. adhatoda</i>	Dark Green	No Characteristic odour	Bitter	Coarse
<i>J. beddomei</i>	Willow Green	Characteristic odour	Bitter	Coarse

Microscopic Evaluation of Leaf

Transverse section of midrib- entire view

In transectional view, the midrib of *J. adhatoda* showed bowl-shaped and thick in abaxial part with short thick two adaxial humps and a shallow median concavity. In *J. beddomei*, the leaf appeared dorsiventral with thick midrib and bilateral lamina. The midrib is plano-convex in sectional view with semi-circular

abaxial part and slightly raised adaxial part with slightly wide and shallow adaxial cavity. The adaxial epidermis of the midrib in *J. beddomei* consisted of small epidermal cells with minute papillate outer tangential walls which is similar to abaxial epidermis consisted of 3 or 4 layers of small thick-walled cells. The lamina of *J. adhatoda* occurred in vertical plain on either side of the midrib. The midrib consisted of thin epidermal layer on both adaxial and abaxial sides. The vascular system *J. adhatoda* and *J. beddomei* showed a wide bowl shaped main vascular strand and one circular adaxial lateral vascular bundle on either side of the vascular arc and a median wide cup-shaped main vascular strand, respectively. The main vascular arc consist of several radial compact xylem elements each row comprising 4 or 5 xylem elements (Fig: 2).

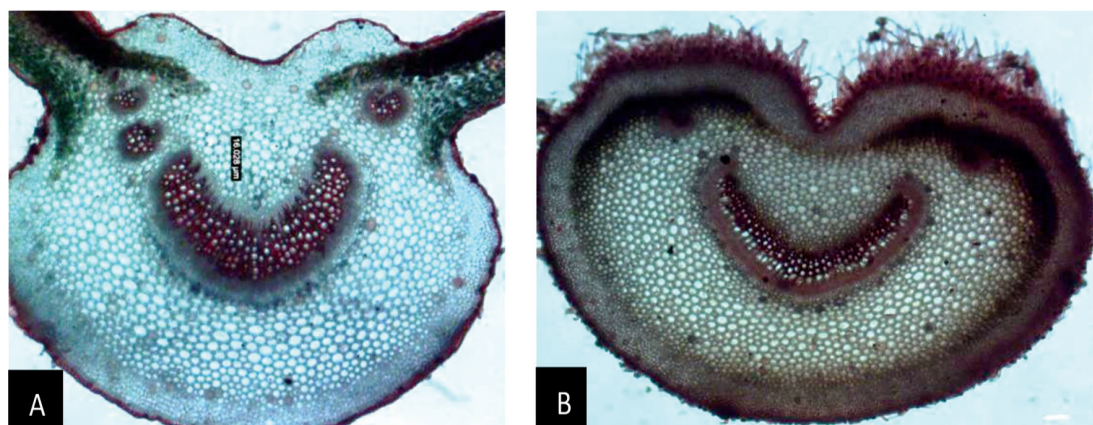


Fig: 2 T.S of *Justicia beddomei* and *Justicia adhatoda*

Physicochemical analysis of leaf powder

In physicochemical evaluation, moisture content, pH, ash values, extractive values were determined. The values obtained for both the species of *Justicia* are summarized in Table 6. It is found that the leaf powder of *J.adhatoda* has higher values for ash constants, thereby indicating presence of impurities as compared to that of *J. beddomei*. Similarly, moisture content is higher for *J. adhatoda* (1.74 ± 0.08) than that of *J.beddomei* (0.22 ± 0.02). This indicates that the leaf powder of *J.adhatoda* is more prone to microbial contamination than leaf powder of *J. beddomei*.

Table 6
Physicochemical analysis of leaf powder

Parameters	<i>Justicia adhatoda</i>	<i>Justicia beddomei</i>
Total ash(%w/w)	12.90±0.09	12.05±0.05
Acid insoluble ash(%w/w)	0.11±0.02	0.07±0.12
Water soluble ash(%w/w)	7.84±0.08	5.405±0.12
Swelling index (%)	2.5±0.01	3.5±0.09
Foaming index (%)	Less than 100	111.11
Loss on drying (%)	1.74±0.08	0.22±0.02

Behavior of leaf powder with chemical reagents

The observations resulted from the leaf powder reaction with chemical reagents are recorded in Table 4. Both the species of *Justicia* characterized by the presence of carbohydrates, starch and alkaloids and absence of anthraquinone and glycosides.

Table 4
Behavior of Leaf Powder with Chemical Reagents

Test	<i>Justicia adhatoda</i>		<i>Justicia beddomei</i>	
	Observation (Colour)	Inference	Observation (Colour)	Inference
Conc. H ₂ SO ₄	Garnet Brown	C-Present	Garnet Brown	C-Present
Iodine Solution	Mandarin Red	S- Present	Canary Yellow	S- Present
Ammonia	Marigold Orange	A and G Absent	Aureolin	A and G-Absent
Conc.HNO ₃ +Ammonia	Marigold Orange	X- Absent	Marigold Orange	X- Absent
Dragendorff's Reagent	Sulphur Yellow	A-Present	Lemon Yellow	A- Present

C-Carbohydrate, S- Starch, A and G- Anthraquinone and Glycosides, X- Xanthoprotein, A- Alkaloid, P- Present, A- Absent * According to the Wilson Color Chart

Fluorescence analysis of leaf powder

The characteristic color, behavior of dried powders dissolved in organic solvents like distilled water, acetone, ethanol, benzene and chloroform were observed both under visible and UV light. The color reactions of this drug solutions thus emitted fluorescence light are summarized in Table 5.

Table 5
Fluorescent Analysis of Leaf Powder

Treatment	<i>J. adhatoda</i>		<i>J. beddomei</i>	
	Short UV	Ordinary Light	Short UV	Ordinary Light
Powder (P)as such	Fern Green	Coriander Brown	Leek Green	Brown
P +Distilled Water	Pea Green	Mimosa Yellow	Cyprus Green	Mimosa Yellow
P+Acetone	Cyprus Green	Primrose Yellow	Veronese Green	Uranium Green
P+Ethanol	Veronese Green	Canary Yellow	Veronese Green	Chartreuse Green
P+Benzene	Agathia Green	Dresden Yellow	Veronese Green	Straw Yellow
P+Chloroform	Fern Green	Primrose Yellow	Sap Green	Pea Green

*According to the Wilson Colour Chart

Conclusion

In present study, two closely related species, *J.adhathoda* and *Justicia beddomei* were compared on the basis of macro morphological qualitative characters like shape of leaf, color of leaf and apex of leaf. In addition to this organoleptic parameters and microscopic evaluations were provided as additional information regarding differences between these two species. From the analysis of leaf powder with chemical reagents, both the species were confirmed for the presence of carbohydrates, starch and alkaloids and absence of anthraquinonoid and glycosides. Physico-chemical analysis of the powdered leaf to evaluate the quality and purity of the drug revealed that *Justicia beddomei* showed less amount of contamination as compared to *Justicia adhathoda*. It is evident through greater moisture content in *Justicia adhathoda* as compared to *Justicia beddomei*.

Acknowledgement

The authors are grateful to the National Medicinal Plants Board, Ministry of Ayush, New Delhi, for the financial assistance under the project "Germplasm Conservation and Phytochemical evaluation of

Adhatoda beddomei" and the Head, Department of Botany, University of Kerala for providing necessary facilities for the conduct of the present work.

References

- Chakraborty A and Brantner A.H., 2001. Study of alkaloids from *Adhatoda vasica* Nees on their anti-inflammatory activity: *Phytotherapy Research* .**15**(6):532-4.
- Aiyer K.N. and Kolammal M., 1963. Pharmacognosy of Ayurvedic Drugs Kerala. Department of Pharmacognosy, Trivandrum 166. Wallis, T. E. *Journal of Pharmacy and Pharmacology: An International Journal of Pharmaceutical Science*, Volume **16** (12).
- Jayapriya G and Shoba F.G., 2015. Phytochemical Analysis. Antimicrobial Efficacy and Determination of Bioactive Components from Leaves of *Justicia Adhatoda* (Linn). *Asian Journal of Plant Science & Research*.
- Indian pharmacopoeia. 1996. Author: India. Ministry of Health and Family Welfare. Published: *Controller of Publications*. 1996-<©2005>
- Mauro C., Silva C.P., Missima J., Ohnuki T., Rinaldi R.B., Frota M., 2008. Estudo anatómico comparado de órgãos vegetativos de boldo miúdo. *Plectranthus Sprengornatus* Codd. emalvaric, o. *Plectranthus amboinicus* Lour. Spreng. Lamiaceae. *Rev. Bras. Farmacogn.* **18**. 608-613.
- Patel P.K. and Bhatt P.H., 1984. *Ind. J. Med. Sci.* **38**. pp.70-72.

Received: 24 February 2022

Revised & Accepted: 23 January 2023

CONTENTS

ARTICLES

Review of the genus *Asystasia* Blume (Acanthaceae)

Viswakumar Sujatha Deepa Lekshmi, Venugopalannair Saradamma Anil Kumar 05

Assessment of growth parameters of micro forest Miyawaki garden in Kariavattom Campus, Thiruvananthapuram

Mohamed Safvan V. K. & Swapna T. S. 15

Pharmacognostical evaluation of leaves of *Justicia adhatoda* L. and *Justicia beddomei* (C.B Clarke) Bennet.

Rajalakshmi R., Prasanth M. K. and Shilpa K. S. 25

PHOTO FEATURE

***Terminalia bialata* (Roxb.) Steud.**

Sam P. Mathew & A. Gangaprasad 31