



Review study on potential activity of *Mukia maderaspatana* (L) Roem

Prakash SL^{1*}, Lavanya P¹, Thiruthani M²

^{1*} PG Scholars, Government Siddha Medical College and Hospital, Palayamkottai.

²Professor & Head, PG Department of Siddha Toxicology, Government Siddha Medical College and Hospital, Palayamkottai.

ABSTRACT

Mukia maderaspatana is a wild functional food plant belonging to the family cucurbitaceae, mostly prevalent in South India. It is distributed throughout the tropical and sub tropical region; Also known as, Musumusukkai in Tamil. It has been used in Indian traditional medicine for centuries. In traditional systems of medicine, various plant parts such as roots, leaves have been used to alleviate a number of human and livestock ailments.

The purpose of the present review is, understanding of its medicinal properties and to reveal the possible effect of this plant in the development of therapeutically active herbal drugs. In this review results shows as; The leaf has the great potency to act as natural antioxidant because of the presence of Phenolic compounds and flavanoids and other pharmacological activities reported by various in vitro and in vivo studies such as; Anti-hypertensive, Anti-oxidant, Hepatoprotective, Immunomodulatory, Antihyperglycaemic, Antihyperlipidemic, Antiplatelet aggregation, Antimicrobial, Antiulcer, Anxiolytic, Local anaesthetic etc.

The fresh plant posses the broad spectrum antimicrobial activity against various bacterial strains including *Bacillus cereus*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Salmonella typhimurium* and also possess prominent activities against the fungal strains such as *Candida tropicalis* and *Trichophyton rubrum*. Finally concluded that *Mukia maderaspatana* whole plant possesses a myriad health care potentials therefore, strongly recommended to include this plant as a dietary supplement same as mentioned in ancient Traditional Siddha systems of medicine respectively.

Keywords:

Mukia maderaspatana, Pharmacological actions, Siddha medicine

Address for correspondence:

Prakash SL

PG Scholar,

PG Dept of Siddha Toxicology

CODEN : IJRPHR

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: publisher@ijrphr.com

To access this article online

Website : <http://www.ijrphr.com/>

DOI : 10.121/ijrphr/02.0203.358

Quick response code



How to cite this article:

Prakash SL, Lavanya P, Thiruthani M, Review study on Potential activity of *Mukia maderaspatana* Roem, International Journal of Reverse Pharmacology and Health Research, 2019, 2(3), 42-48

Received: April, 2019.

Accepted: June, 2019.

INTRODUCTION

Mukia maderaspatana (L.) M. Romer., is an annual monoecious tendril climber, belonging to the family Cucurbitaceae. It is commonly called Musumusukkai in Tamil. It is distributed throughout and subtropics of the World and is propagated in India, Sri Lanka and other countries in South-East Asia, such as Mainland Southeast Asia and Maritime Southeast Asia, Ryukyu and Yaeyama islands. In India it is mainly found in Uttar Pradesh, Arunachal Pradesh, Tamilnadu, Kerala, Andhra Pradesh and Andaman and Nicobar islands.

Indigenous communities around the world utilize various parts of the plant to alleviate a number of human and livestock ailments. In traditional systems of medicine various plant part such as leaves and roots have been used as Expectorant, Diuretic, Anti Inflammatory, Diaphoretic, Laxative, infertility, Sudorific, Aperient, carminative, and also in the treatment of Asthma cough, acid reflex, anxiety, flatulence, skin disease, Ulcers, biliousness, constipation, toothache and Vertigo etc. The chief Siddha and Ayurveda preparations of *Mukia maderaspatana* are Musumusukkai choornam, Chandanadi kritham, Maha kalyana kritham, Kapha roga mathirai, Manasa mithra vadakam, pipalyasava and Rasayanarishta. In Siddha the roots and leaves are used to treat Fever, dyspnoea, Abdominal discomfort, cough and vomiting. The purpose of the present review is, understanding of its medicinal properties and to reveal the possible effect of this plant in the development of therapeutically active herbal drugs.

Plant profile



Vernacular Names

Eng :Rough bryony, Madras pea pumpkin
Hindi :Agumaki, Bilari
Tamil : Musumusukkai
Telugu : Noogudos, Kooturubudana
Malayalam : Mukkalbeeram, Chitrate
Bombay : Chirati
Sanskrit : Abilekhaha

Chemical Constituents

The leaves contains mainly Dichloroacetic acid, 4-methylpentyl ester, 2- Butyn-1, 4- methoxy and also showed the presence of other constituents like flavanoids, carbohydrates, tannins, phenolic compounds, uncharacterized steroids, triterpenes, alkaloids, catechins and saponins . Eugenol is the major component found in the whole plant of *mukia maderaspatana* and it is responsible for its repellent property. Aminoacids: L-glutamic acid, D-,L-alanine, L-leucine, D-,L-serine, D-,L-aspartic acid, L-proline,

L-tyrosine, D-,L-threonine, phenylalanine, D-,L-3,4-dihydroxyphenylalanine, L-hydroxyproline, D-,L-norleucine, D-,L-methionine, L-arginine monohydrochloride, L-glycine and D-,L-valine.

The following sugars, namely, arabinose, fructose, glucose, mannose, sucrose, xylose, galactose and ribose.

The presence of spinasterol, 22, 23-dihydrospinasterol, its 3-O- β -D-glucoside, β -sitosterol, and decosaenoic acid have also been reported from the leaf extract.

From the aerial parts of the taxon, has detected the presence of steroids, triterpenes, flavonoids, reducing sugars and glycosides. A systematic analysis of the flavonoid constitution of the aqueous alcoholic leaf-extract has resulted in the isolation and characterization of six C-glycol-flavones, viz., 6-C- β -D-glucopyranosyl apigenin (isovitexin), 6-C- β -D-glucopyranosyl luteolin (homoorientin), 8-C- β -D-glucopyranosyl apigenin (vitexin) and 8-C- β -D-glucopyranosyl luteolin (orientin), 7-O- β -D-glucopyranosyl-6-C- β -D-glucopyranosyl apigenin (saponarin) and 7-O- β -D-glucopyranosyl-6-C- β -D-glucopyranosyl luteolin (lutonarin).

Columbin has been isolated from its roots and the seed oil (18.8 g per 100 g) has been reported to be rich in linoleic (50 %), oleic and palmitic acids.

Traditional uses:

In Siddha

1. The root and leaves used to treat fever, dyspnoea, abdominal disorders, hepatic disorders, bronchitis, impotency, cough and vomiting.
2. The leaf decoction is used to treat hypertension and Naso-bronchial diseases.
3. The decoction or choornam prepared with Root of Musumusukkai will cure vomiting and Heart diseases.
4. The drug is an main ingredient in Musumusukkai choornam, kapha roga mathirai.

In Ayurveda

1. The plant is used to treat asthma, cough, burning sensation, dyspepsia, flatulence, colic, constipation, ulcer, neuralgia and vertigo
2. The fruits are reportedly used in the treatment of dysuria, piles, polyuria and tuberculosis.
3. The drug is an ingredient in Ayurvedic preparation like Pipalyasava, Rasayanarishta, Srikandasava and Manasa-mithravadagam

In Naturopathy

1. The plant drug is claimed to strengthen lungs and other organs associated with breathing and controls wheezing, allergy, dry cough, sneezing, lethargy, tuberculosis and asthma.

In Ethnomedicine

1. Folkloric traditional medicines claims that the leaves and tender shoots are useful as aspirants, diuretic, stomachic, antipyretic, anti-asthmatic, antitussive, antihistaminic and as an expectorant
2. Leaf paste is externally applied to wounds ,scabies and the ringworm infection
3. Leaf extract is consumed internally to cure piles; applied to the hair to blacken the grey hair

Table 1: Different therapeutic activities reported in *Mukia maderaspatana* plant

Plant part / Extract	Activity	Animal / model	Result	Control	Reference
Ethanol-ic Leaf extract	Anti-hypertensive	DOCA-salt-induced hypertensive male albino Wistar rats	Significantly reduced the Systolic Blood pressure (SBP) and Diastolic Blood pressure (DBP) and the effect has been more pronounced at 200 mg/kg body weight dose	Nifedipine (20mg/kg bw)	Veeramani et al, 2011
Crude Ethanol-ic Leave Extract (CELE)	Anti-hypertensive	0.5% DMSO solutions to EAF-treated rodent	0.5% DMSO solutions of the Chloroform fraction (CF), EAF and MF of the CELE (60mg/kg bw, po by intubation) had resulted in significant lowering of the SBP and DBP only among the EAF-treated rodent after six weeks.		Veeramani et al, 2012
Leaf extract	Anti-oxidant	presence of gallic acid	it is reported to contain 292.4 mg gallic acid equivalents of phenolics/100g fresh leaf material.		Petrus et al, 2011
Leaves	Antioxi-dant	flavonoids	the protection against cardiovascular and other free radical-mediated diseases by 247.1mg quercetin equivalents of flavonoids/100g fresh leaf material.		Petrus et al, 2012
Fresh leaves	Antioxi-dant	7-O-β-D-glucopyranosyl-6-C-β-D-glucopyranosides of luteolin and apigenin and luteolin	these compound have been reported to possess RS, including superoxide and nitric oxide, scavenging and metalchelating antioxidant capacities		Petrus et al, 2012
Aerial parts	Hepato-protective	CCl ₄ -induced liver damage in albino rats	the aqueous extract of the aerial parts to protect albino rat-liver from Carbontetrachloride (CCl ₄)-induced damages has been evaluated and reported.		Thabrew et al, 1995
Aerial parts	Hepato protective	Streptozotocin (STZ) -induced diabetic Sprague-Dawely rats	Reduction in the levels of SGOT, SGPT and ALP of treated STZ induced diabetic Sprague-Dawely rats		Balaraman et al, 2010
Root	Hepato-protective	Alloxan induced diabetic rats	the methanolic root extract (500mg/kg, q.d, p.o.,21 d) has recorded to significantly decrease the elevated SGOT, SGPT and ALP in alloxan-administered diabetic rats to normalcy after 21 days treatment		Wani et al, 2011
Whole plant	Immuno-modulatory	in-vitro study of luminol-induced chemiluminescence of human polymorphonuclear leukocytes	the aqueous extract of the whole plant had exhibited a direct dose-dependent inhibition of luminol-induced chemiluminescence of human polymorphonuclear leukocytes upon stimulation with zymosan		Thebrow MI, et al, 1991
Whole plant	Anti-hypergly-caemic	Alloxan induced diabetic male Wistar albino rats	Ethanollic extract of whole plant (100 and 200mg/kg bw, po) to Alloxan induced diabetic male Wistar albino rats was reported to have decreased the blood glucose levels by 20 - 24.4% by 5hours treatment		Vadivelan R, et al, 2010
Aerial parts	Anti-hypergly-caemic	Streptozotocin (STZ) -induced diabetic Sprague-Dawely rats	Ethanollic aerial parts for 14 days had been claimed to cause significant reduction in Blood Glucose level an significant increase in glycogen formation		Balaraman et al, 2010

	Activity	Animal / model	Result	Control	Reference
Stem	Anti-hyperglycaemic	Alloxan-induced diabetic Sprague-Dawely rats	Ethanol and aqueous stem extracts treatment, exhibited significant hypoglycemic activity by increase in glucose uptake in L-6 skeletal muscle cells in vivo		Kur M, <i>et al</i> , 2009
Root	Anti-hyperglycaemic	Alloxan-induced diabetic Sprague-Dawely rats	Methanolic root extracts treatment, exhibited significant hypoglycemic activity	Glibenclamide (07mg/kg)	Wani <i>et al</i> , 2011
Aerial parts	Anti-hyperglycaemic	Oral glucose tolerance test	On over night-fasted male mice, effect of the drug (200mg/kg, po) Ethanolic extract of the aerial parts on insulin and beta cell functions of pancreas at glucose load under condition	Metformin (300mg/kg, po)	Balaraman <i>et al</i> , 2011
Whole plant	Anti-hyperglycaemic	α -amylase and α -glucosidase inhibitory	Ethanolic extract of the whole plant reported to exhibited		Vadivelan R, <i>et al</i> , 2012
Dried aerial parts	Anti-hyperlipidemic	High fat diet albino rat	the aqueous extract of dried aerial parts (2g/kg, po.) concomitantly with high fat diet to albino rats of either sex (Charles Foster Strain) for 7 weeks had displayed significant reduction in the lipid level		Pandey D, <i>et al</i> , 2010
Aerial parts	Anti-hyperlipidemic	Streptozotocin (STZ)-induced diabetic Sprague-Dawely rats	STZ-induced diabetic Sprague-Dawely rats concurrently treated with 100 and 200 mg/kg bw, po., of ethanolic aerial parts for 14 days reported to have recovered from the altered biochemical parameters and bodyweight		Balaraman <i>et al</i> , 2010
Whole dried plant	Anti-hyperlipidemic	Streptozotocin (STZ)-induced diabetic Sprague-Dawely rats	the aqueous extract of the whole dried plant (2g/kg, po., 7d) is also reported to have caused significant lowering of serum TC and LPO and also hepatic LPO parameters in diabetic rats		Hemalatha S, <i>et al</i> , 2010
Whole plant	Anti-hyperlipidemic	Alloxan induced diabetic male Wistar rats	21 days methanolic root extract exhibits decreased levels of the diabetic related elevations in TC, TG, phospholipids, LDL and VLDL parameters. And increased in the lowered HDL - level		Wani <i>et al</i> , 2011
Whole plant	Antiplatelet aggregation	in-vitro study of Antiplatelet aggregation activity	the HF, CF, EAF and MF fractions of whole plant had been studied using platelet-rich plasma		Iman RA, <i>et al</i> , 2006
Fresh plant	Antimicrobial	in-vitro	Ethanolic extract against <i>Bacillus cereus</i> , <i>Enterococcus faecalis</i> , <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i> , <i>Escherichia coli</i> , <i>Klebsiella pneumoniae</i> , <i>Pseudomonas aeruginosa</i> and <i>Salmonella typhimurium</i> but had failed		Palombo EA, <i>et al</i> , 2001
Fresh plant	Antimicrobial	10 μ g/mL DMSO solutions of the PEF and MF	Reported to be prominent activities against the fungal strains, <i>Candida tropicalis</i> and <i>Trichophyton rubrum</i> (100 μ g/mL DMSO solutions)		Shree Devi MS, <i>et al</i> , 2011
Leaves and stem	Antimicrobial	Ethanol extract	Inhibited <i>E. coli</i> , <i>K. pneumonia</i> , <i>Pseudomonas putida</i> , <i>Proteus mirabilis</i> , <i>S. aureus</i> , <i>Aeromonashydrophila</i> , <i>Rhizobus</i> sp. and <i>Aspergillus flavus</i> better than CF and AF		Sagayarai <i>et al</i> , 2012
Dried Leaves	Antiulcer	Aqueous suspension	The crude aqueous suspension of the dried leaf had been investigated on male albino rats of Wistar strain		Dhanaraj TS, <i>et al</i> , 2012

S.No	Activity	Animal / model	Result	Control	Reference
Leaves	Anxiolytic	Hydro-alcoholic extract	Hydro-alcoholic extract of the leaves among experimental rodents that have been subjected to state anxiety conditions		Saravanan S, et al, 2012
Leaves	Anxiolytic	Healthy Wister strain rats	Normal healthy Wister strain rats, behavioural deficit test carried out using mice of both sexes as 150mg/kg, po.	Diazepam (1mg/kg bw, intra peritoneal)	Saravanan S, et al, 2012
Air-dried leaf	Local anaesthetic	Healthy frogs of either sex	Ethanol and Aqueous extracts of the air-dried leaves had evaluated in healthy frogs of either sex, using nerve block anaesthesia method		Sarojini S, et al, 2008

1. Root decoction is used for the relief of tooth-ache
2. Leaf juice prepared using rice fermented water is taken orally to reduce bile accumulation (pitham)
3. Leaf powder is consumed with rice water to reduce chest pain
4. Leaf juice with gingelly oil is applied topically on the head before taking bath to cure asthma.
5. Root extract combined with *Cuminum cyminum* is used to treat spermatorrhoea.
6. Fruit is used in the treatment of paronychia
7. Leaf paste is mixed with Jaggery is administered for the removal of the effect of poison in of scorpion bite

In livestock health and diseases

1. *Mukia maderaspatana* is widely used in the health care of livestock
2. In Andrapradesh the leaves, pounded with garlic, jpepper and cumin are used for treating hygroma in cattle.
3. It is also useful in increasing body immunity and in controlling digestive disorders of cattles.
4. The plant in combination with other medicinal plants is used to treat a number of live stock diseases such as adenitis, piroplasmosis, plague, anthrax, rabies, madness, anaplasmosis and gastroenteritis.

Other Uses

1. The tender shoots and bitter leaves are used as aperients in India and are taken for vertigo and biliousness
2. The leaf-sap is used as a wound dressing, leaves in poultice for burns, and the sap is given for small children for amoebiasis.
3. Dried powdered leaves are dusted over scabies; and the plant ash in castor oil is rubbed over scarification and for headache.
4. In Nigeria the plant is used as a preventive or a cure for 'oka', a disease of children's heads
5. The plant is said to have expectorant properties.
6. In Senegal, the fruit is used as a vermifuge, the leaves are used for treating mental disorders.
7. The root is chewed to relieve facial neuralgia, toothache etc.
8. In Australia the whole plant is used as a general medicine and to relieve headache and skin sores and to treat sore eyes.

DISCUSSION AND CONCLUSION

The medicinal importance of the plant *Mukia maderaspatana* evidently prove that it possess a lot of therapeutic values. The leaf has the great potency to act as natural antioxidant because of the presence of Phenolic compounds and flavanoids and other pharmacological activities reported by various in vitro and in vivo studies such as; Anti-hypertensive, Antioxidant, Hepatoprotective, Immunomodulatory, Antihyperglycaemic, Antihyperlipidemic, Antiplatelet aggregation, Antimicrobial, Antiulcer, Anxiolytic, Local anaesthetic etc.

The fresh plant posses the broad spectrum antimicrobial activity against various bacterial strains including *Bacillus cereus*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Salmonella typhimurium* and also possess prominent activities against the fungal strains such as *Candida tropicalis* and *Trichophyton rubrum*

Considering the above properties, it comes to conclusion that *Mukia maderaspatana* whole plant that an indigenous herbal medicine is possessing a myriad health care potentials, such as; protection against the widely prevalent Hypertension, Diabetes mellitus and Rheumatoid arthritis. Hence these review results, strongly recommended to include this plant as a herbal medicine same as mentioned in ancient Traditional Siddha systems of medicine respectively.

FINANCIAL SUPPORTS

Nil

CONFLICTS OF INTEREST

None declared.

REFERENCES

1. Alonso.L.E and L.-A. Nordin, A Rapid Biological Assessment of the Aquatic Ecosystems of the Okavango Delta, Botswana: High Water Survey. RAP Bulletin of Biological Assessment 27. Conservation International, Washington, DC., p. 168 (2003).
2. Burkill.H.M, The Useful Plants of West Tropical Africa, Royal Botanical Gardens, Kew, 1, 1 (1985).
3. Chong.K.Y, H.T.W. Tan and R.T. Corlett, A Checklist of the Total Vascular Plant Flora of Singapore: Native, Naturalized and Cultivated Species, Raffles Museum of Biodiversity Research and Department of Biological Sciences, Faculty of Science, National University of Singapore, p. 30, 124, 266 (2009). Vol. 24, No. 6 (2012) *Mukia maderaspatana* (L.) M. Roemer-A Review 2367
4. Haines.H.H, A Forest Flora of Chota Nagpur Including Gangpur and the Santal- Parganahs, Bishen Singh Mahendra Pal Singh and Periodical Experts, Delhi (1910).
5. Hoffman.P and R. Warner, A Vegetation and Flora Survey of the Mesa K Mine-site, near Pannawonica, Biota Environmental Sciences Pvt. Ltd., Leederville Western Australia, (2007).
6. Huang.T.C, in eds.: Editorial Committee of the Flora of Taiwan, Department of Botany, NTU, Taipei, Taiwan, edn. 2, vol. 3, p. 682 (1993).
7. Hutchinson.J and J.M. Dalziel, Flora of West Tropical Africa, The University of Chicago Press, Chicago, U.S.A., vol. 1, p. 1 (1954).
8. Iman.R.A, B.L. Priya, R. Chithra, K. Shalini, V. Sharon, D. Chamundeeswari and J. Vasantha, Indian J. Pharm. Sci., 68, 668 (2006).
9. In Proceedings of 11th International Plant Virus Epidemiology Symposium and 3rd Workshop of the Plant Virus Ecology Network, Cornell
10. Inventory and Condition Survey of the Pilbara Region, Western Australia, Technical Bulletin No. 92, Department of Agriculture, South
11. Khatoon.S and G. Akbar, Natural Vegetation Assessment-Indus for All Programme, WWF, Pakistan (2008).
12. Kittur.M.H, C.S. Mahajanshetti, T.N.B. Kaimal and G. Lakshminarayana, J. Oil Technol. Assoc. India, 15, 43 (1973).
13. Kotia.A, in ed.: G.S. Rawat, Special Habitats and Threatened Plants of India. ENVIS Bulletin: Wildlife and Protected Areas, Wildlife Institute of India, Dehradun, India, 11, 94 (2008).
14. Kumar.A, A.K. Gupta, B.G. Marcot, A. Saxena, S.P. Singh and T.T.C. Marak, Management of Forests in India for Biological Diversity and Forests Productivity-A New Perspective- Garo Hills Conservation Area (GCA). WII-USDA Forest Service Collaborative Project Report, Wildlife Institute of India, Dehra Dun, 4, 159 (2002).
15. Kutt.A and J. Kemp, Flora and Fauna Survey of the Inkerman and Molongle Blocks, Burdekin River Irrigation Area, Right Bank, Report No. 97/24, Australian Centre for Tropical Freshwater Research (ACTFR), James Cook University of North Queensland, Townsville, (1998).
16. Morris.K, Dampier Archipelago Nature Reserves Management Plan 1990-2000, Department of Conservation and Land Management, p. 28 (1990).
17. Murukesa muthaliyar.K.S., Gunapadam Mooligai Vagupu, Department of Indian System of Medicine and Homeopathy, Page.no.766.(2013)
18. Nazimuddin and S.S.H. Naqvi, in eds.: E. Nasir and S.I. Ali, Flora ofPakistan, No. 154, National Herbarium, Pakistan Agricultural Research Council, Islamabad and Department of Botany, University of Karachi,Pakistan, p. 4 (1984).
19. Odugbemi.T and O. Akinsulire, in ed.: T. Odugbemi, Outlines and Pictures of Medicinal Plants from Nigeria, University of Lagos Press, Lagos, Nigeria, p. 101, 226 (2008).
20. Priyadi.H, G. Takao, I. Rahmawati, B. Supriyanto, W.I. Nursal and I. Rahman, Five Hundred Plant Species in Gunung Halimun Salak National Park, West Java, Center for International Forestry Research, Bogor, Indonesia, p. 17 (2010).
21. Quadros.G, G. Gurav, K. Bhagat, A. Chorgha, A. Dhamorikar, K. Khot and M. Nagarkar, Report of the Study of the Biodiversity of Indian Institute of Technology Bombay Campus by WWF-India MSO for IITBombay, pp. 17-62 (2009).
22. Ramsar Site, Report to the Department of Environment and Conservation, Perth, Western Australia, p. 121 (2008).
23. Senaratna.L.K, A Check List of the Flowering Plants of Sri Lanka, National Science Foundation, Colombo, Sri Lanka, p. 99 (2001).
24. Shrestha.K.K and D.A. Sutton, Annotated Checklist of the FloweringPlants of Nepal, The Natural History Museum, London (2000).
25. Singh.M.P and H. Panda, Medicinal Herbs with their Formulations, Daya Publishing House (2005).
26. Singh.N.P, Flora of Eastern Karnataka, 1st Edition Mittal Publications, Delhi, India, p. 85 (1988).
27. Singleton.V.L, R. Orthofer and R.M. Lamuela-Raventós, Methods Enzymol., 299, 152 (1999).
28. Wiersema.J.H and B. León, World Economic Plants: A Standard Reference, CRC Press LLC, Boca Raton, Florida, edn. 2, p. 140 and 333 (1999).
29. Wijesinghe.Y, Checklist of Woody Perennial Plants of Sri Lanka, SriLanka Forest Department, Battaramulla, Sri Lanka, p. 35 (1994).