



ISSN (E): 2320-3862

ISSN (P): 2394-0530

www.plantsjournal.com

JMPS 2024; 12(3): 58-62

© 2024 JMPS

Received: 23-03-2024

Accepted: 26-04-2024

Nihalini KalitaDepartment of Pharmaceutical
Technology, University of North
Bengal, Raja Rammohunpur,
Darjeeling, West Bengal, India**Partha Pratim Maiti**Department of Pharmaceutical
Technology, University of North
Bengal, Raja Rammohunpur,
Darjeeling, West Bengal, India

Pharmacognostical, phytochemical, pharmacological evaluation of *Melastoma malabathricum* Plant Linn.: A Review

Nihalini Kalita and Partha Pratim Maiti

Abstract

This comprehensive review investigates the pharmacognostical, phytochemical, and pharmacological attributes of *Melastoma malabathricum* L., a plant species belonging to the Melastomataceae family, commonly known as senduduk. This plant thrives in various habitats, including waste grounds and open fields in Malaysia, and is traditionally used across Indonesia, Malaysia, and India for its therapeutic properties. Phytochemical investigations have revealed a diverse array of bioactive compounds within the plant, supporting its traditional medicinal applications. Furthermore, numerous pharmacological studies have demonstrated its potential in treating a range of conditions, including inflammation, oxidative stress, microbial infections, and cancer. However, further research is needed to elucidate the underlying mechanisms of action and to validate its efficacy and safety for human use. Overall, *Melastoma malabathricum* presents itself as a promising source of natural compounds with significant pharmacological potential, warranting continued exploration in the field of herbal medicine.

Keywords: *Melastoma malabathricum*, pharmacognostical, phytochemical, pharmacological, traditional medicine

Introduction

India possesses the expertise and know-how to advance its R&D capacities. In terms of medicinal plant exports, it ranks second. It could consider building its own R&D capabilities and producing finished goods in the form of contemporary medicines and health care products derived from plant origin and based on the knowledge of alternative systems of medicine, rather than exporting such a large amount of valuable resource with very low returns. Approximately 80% of people worldwide utilize herbal medications, which are in high demand. (Bhowmik D *et al.*, 2009) ^[1]. Traditional or ethno medicine is based on the medical uses of plants, which have been utilized for ages by many civilizations worldwide. The therapeutic applications of plants in conventional medical practices-often handed down through generations within particular communities-are referred to as ethno medical advantages. The Melastomataceae family of plants, which includes over 4,000 species worldwide, is native to tropical and subtropical climates. The genus *Melastoma* includes 22 species, 2 subspecies, and 3 variations only in Southeast Asia (Joffry SM *et al.*, 2012) ^[2]. *Melastoma malabathricum* L. is a plant species from the Melastomataceae family which is commonly a shrub. In Malaysia, waste grounds and open fields are a frequent habitat for *Melastoma malabathricum* (MM), also referred to as senduduk ^[2]. In Indonesia, Malaysia, and India, people utilize its roots, bark, and leaves as medicine to cure leucorrhoea, hemorrhoids, diarrhea, wounds, dysentery, stomachache, confinement infections, toothache, thrush, flatulence, and painful legs (Kumar V *et al.*, 2013) ^[3].



Purple flower of *Melastoma malabathricum*

Pink flower of *Melastoma malabathricum*

White flower of *Melastoma malabathricum*

Corresponding Author:**Nihalini Kalita**Department of Pharmaceutical
Technology, University of North
Bengal, Raja Rammohunpur,
Darjeeling, West Bengal, India

Melastoma malabathricum is a three-type plant (Idris M *et al.*, 2022) [4].

The large, dark purple-magenta blooms comprise the first variation. Edium-sized blooms with pale pinkish-magenta petals make up the second variation. The third variety is a rare one that has little white flowers.



Fig 1: Ripe fruit



Fig 2: Unripe fruit

Fruit is produced by the plants between May and July (Susanti *et al.*, 2006) [5]. It has been reported that a variety of plant parts, including the roots, stems, leaves, flowers, and fruit of Senggani, exhibit pharmacological activities at varying dosages and concentrations, including antiviral, antibacterial, anti-parasite, cytotoxic, antioxidant, anticoagulant, Platelet Activating Factor (PAF) inhibition, antiulcer, anti-inflammatory, wound healing, antipyretic, antinociceptive, antivenom, and antidiarrheal (Khoo LT *et al.*, 2014) [6]. Because of its traditional therapeutic uses, this shrub plant is one of the natural plant resources that has drawn interest from scientists (Wong KC *et al.*, 2012) [7].

Botanical description

Melastoma malabathricum, an evergreen tree, exhibits distinctive features that contribute to its identification. The tree is characterized by its perennial flowering, maintaining blossoms throughout the year. Typically, it attains a height of about 4 meters, although instances of growth reaching up to 6 meters have been observed (Ringmichon CL *et al* 2010 [8]; Parthana C *et al.*, 2023) [9].

Specific features

Leaf

- **Leaf Shape:** Typically elliptical or ovate.
- **Leaf Size:** 3.5 cm wide and 14 cm long.

- **Leaf colour:** Lower surface, which is a lighter green, top surface has a little darker green colour.
- **Leaf Venation:** Reticulate.
- **Leaf Texture:** Hairy.

Flower

- **Flower Color:** Diverse, including shades of pink, purple, or white
- **Calyx:** Lanceolate to ovate calyx lobes
- **Corolla:** Pentamerous (with five petals)
- **Stamens:** Numerous, with anthers containing pollen
- **Pistil:** Single
- **Flowering Period:** May to July which only last one to two days, are grouped together in groups of five to ten

Fruit

- **Shape:** Oval-shaped
- **Fruit Type:** Berry (varies among different varieties)
- **Fruit Size:** Typically small, ranging from 0.5 to 1 centimeter
- **Fruit Color:** creamy white while immature, split open to reveal the soft, dark purple pulp and numerous seeds
- **Taste:** Sweet

Stem

- **Branching Pattern:** Numerous, procumbent, and highly scaled branchlets are present.
- **Stem Color:** Green to reddish-brown
- **Surface Texture:** Small bristles, hairs, and rough, tiny scales coated

Vernacular name

SL No	Vernacular name	Country	Reference
I.	Phutkola, phutuka, phutuka	Assam, India	Borgohain <i>et al.</i> , 2022 [10] Sarmah R <i>et al.</i> , 2016 [11]
II.	Phutki	Bangladesh	Kader MA <i>et al.</i> , 2023 [12]
III.	Longumpu	Manipur	Ringmichon CL <i>et al.</i> , 2010 [7]
IV.	“Senduduk”	Malaysia	Zakaria ZA <i>et al.</i> , 2006 [13]
V.	Singapore rhododendron	Singapore, Britain	Koh HL <i>et al.</i> , 2009 [14]
VI.	Ye mu dan	china	Wu ZY <i>et al.</i> [15]
VII.	Malabar melastome	Australia	Ong HC <i>et al.</i> 1999 [19] Ong HC <i>et al.</i> , 1999 [17]

Taxonomical classification

Kingdom: Plantae Clade: Angiosperms Order: Myrtales

Family: Melastomataceae Genus: *Melastoma*

Species: *Melastoma malabathricum*

Binomial name: *Melastoma malabathricum* L.

Source: https://en.wikipedia.org/wiki/Melastoma_malabathricum

[18]

Cultivation

The species *Melastoma malabathricum* is widespread throughout South and Southeast Asia. It grows quickly and profusely throughout the tropics, especially in moist environments (Wong W., 2008) [19].

They are the main settlers of pastures, landslides, roadsides, light gaps, damaged habitats, secondary areas, and rivers. This plant is typical of hot, humid, tropical lowlands; it is found only at higher altitudes in tropical regions and is more widely distributed in the north. It favors soil that is open, well-drained, fertile, and rich in humus. This species outcompetes native flora with ease, growing quickly, tolerating shade,

having no natural pests, and producing an abundance of seeds with a high rate of germination that result in monospecific stands. It was brought for ornamental purposes to many areas,

but since it competes with both wild and cultivated species, it has spread like a weed and caused significant economic harm in one instance (Faravani M *et al.*, 2007) ^[20].

Phytochemical classification

SL No	Phytochemicals	Chemical constituents	Reference
I.	Phenolic compounds	Ellagic acid, 1,4,6-tri-O galloyl- β -D-glucose (31a) and 1,2,4,6-tetra-O-galloyl- β -D-glucose (Galloyl Glycosides)	Sari NM <i>et al.</i> , 2018 ^[21] Zheng WJ <i>et al.</i> , 2021 ^[22]
II.	Flavonoids	alpha amyryn, quercetin, quercitrin, patricabratrin, auranamid, anthocyanin, Glucoside, Rutin, Astragalin, Kaempferol, Quercetin- 3b-D-glucoside	Isnaini <i>et al.</i> , 2018 ^[23] , Lee TH <i>et al.</i> , 2022 ^[24]
III.	Alkaloids	Patricabratrine	Suleiman D <i>et al.</i> , 2018 ^[25]
IV.	Tannins	Strictinin, Casuarinin, Ellagitannin and galloyl esters, Corilagin	Mayasari D <i>et al.</i> , 2021 ^[26] , Lee TH <i>et al.</i> , 2022 ^[21]
V.	Steroids	daucosterol, β -sitosterol	Zheng WJ <i>et al.</i> , 2021 ^[22]
VI.	Terpenoids	Saponin, asiatic acid, ursolic acid, 2-hydroxyursolic, α -amyryn, uvaol, betulinic acid, melastomic acid, serrat-14-en-16-one	Zheng WJ <i>et al.</i> , 2021 ^[22]
VII.	Organic esters	gallic acid, hexacosanoic acid, 1-octyl decanoate A, dimethyl hexamethoxydiphenate, brevifolincarboxylic acid	Zheng WJ <i>et al.</i> , 2021 ^[22]
VIII.	Protein	nitrogen-containing compounds	Lee TH <i>et al.</i> , 2022 ^[24]
IX.	Carbohydrate	Polysaccharide	Lee TH <i>et al.</i> , 2022 ^[24]

Ethnopharmacological uses

SL No	Country	Plant part	Method of preparation/administration	Medicinal uses	Reference
I.	Manipur, Mizoram India	Leaf (decoction or juice) Bark (decoction or juice)	Fresh or dry leaves Decoction or juice	Cure dysentery and diarrhoea, cuts and wounds, stomach disorders, and fever. The plant's bark is used as a gargle to treat diarrhea and dysentery.	Sharma HK <i>et al.</i> , 2001 ^[27] Ringmichon CL <i>et al.</i> , 2010 ^[8]
II.	Bangladesh	Root Leaf	Decoction or juice	Jaundice is treated with the root juice. Leukorrhea is treated orally with the root juice or water extract of boiling roots. The leaf juice is used to treat a variety of urinary issues and as a diuretic.	Rahmatullah M <i>et al.</i> , 2009 ^[27] Rahmatullah M <i>et al.</i> , 2009 ^[29] Rahmatullah M <i>et al.</i> , 2010 ^[30]

Pharmacological activities

SL no	Pharmacological activity	Plant Part	Types of extract	Assay used	Reference
I.	Antioxidant	Flower Plant Leaves Leaves Plant	Methanol Aqueous Ethanol Aqueous Methanol Methanol Ethanol	DPPH scavenging Activity ABTS Superoxide ORAC FRAP	Susanti D <i>et al.</i> , 2008 ^[38] Alnajjar ZA <i>et al.</i> , 2012 ^[39] akaria ZA <i>et al.</i> , 2011 ^[40] Mamat SS <i>et al.</i> , 2013 ^[41] Alnajjar ZA <i>et al.</i> , 2012 ^[39]
II.	Antibacterial	Plant Leaves	Ethanol aqueous	MIC (Disc Diffusion Method) MIC	Alnajjar ZA <i>et al.</i> , 2012 ^[39] Khan MM <i>et al.</i> , 2020 ^[42]
III.	Anti-inflammatory	LeavesLeaves	Methanol Methanol	PAF assay TPA (12-O-tetradecanoylphorbol-13-acetate)-induced Mouse Ear Oedema method. The carrageenan- induced paw edema test	Mazura MP <i>et al.</i> , 2007 ^[43] Susanti D <i>et al.</i> , 2008 ^[38]

		Leaves	Aqueous		Zakaria ZA <i>et al.</i> , 2006 ^[13]
IV.	Antidiabetic	leaves	Methanol	Alpha amylase Alpha glucosidase Streptozotocin induced diabetic rats	Idris M <i>et al.</i> , 2022 ^[4]
V.	Wound healing	Leaves	Methanol	Excision wound model Incision wound model	Anbu J <i>et al.</i> , 2008 ^[44]
VI.	Anticoagulant	Leaves	Hot water extract	clot-based assays Activated partial thromboplastin time (aPTT) Prothrombin time (PT) Thrombin time (TT)	Manicam C <i>et al.</i> , 2010 ^[45]
VII.	Anti-pyretic	leaves	aqueous	Brewer's yeast induced pyrexia	Zakaria ZA <i>et al.</i> , 2006 ^[13]
VIII.	Anti diarrhoeal	Leaves	Ethanol	Castor oil induced diarrhoea	Havagiray RC <i>et al.</i> , 2004 ^[46] Karuppasamy Balamurugan KB <i>et al.</i> , 2004 ^[47]
IX.	Antinociceptive	leaves	aqueous	Abdominal constriction test Hot- plate test	Zakaria ZA <i>et al.</i> , 2006 ^[13]

9. Conclusion

This thorough analysis concludes by highlighting the pharmacological, phytochemical, and pharmacognostical characteristics of *Melastoma malabathricum* and providing insight into its possible therapeutic uses. Numerous phytochemical studies highlight the wide range of bioactive substances found in different plant portions, giving traditional therapeutic uses of the plant a scientific foundation. *Melastoma malabathricum* extracts and isolated chemicals have also shown a variety of pharmacological properties, which support its pharmacotherapeutic potential in treating a variety of illnesses, such as antidiabetic, oxidative stress, inflammation, antinociceptive, wound healing. Anticoagulant and microbial infections. To confirm its effectiveness and safety for use in humans, more study is necessary to clarify the underlying mechanisms of action, improve extraction techniques, and carry out clinical trials. All things considered, this review emphasizes how important *Melastoma malabathricum* is as a natural chemical source.

10. Acknowledgement

The authors sincerely thanks to the Department of Pharmaceutical Technology, University of North Bengal for providing the necessary support for doing this work

10. References

- Bhowmik D, Kumar KS, Tripathi P, Chiranjib B. Traditional herbal medicines: An overview. Arch Appl Sci Res. 2009;1(2):165-77.
- Joffry SM, Yob NJ, Rofiee MS, Affandi MM, Suhaili Z, Othman F, Akim AM, Desa MM, Zakaria ZA. *Melastoma malabathricum* (L.) Smith ethnomedicinal uses, chemical constituents, and pharmacological properties: a review. Evid Based Complement Alternat Med. 2012 Oct;2012.
- Kumar V, Ahmed D, Gupta PS, Anwar F, Mujeeb M. Anti-diabetic, anti-oxidant and antihyperlipidemic activities of *Melastoma malabathricum* Linn. Leaves in streptozotocin induced diabetic rats. BMC Complement Altern Med. 2013 Dec;13(1):1-9.
- Idris M, Purnomo AS, Martak F, Fatmawati S. Antioxidant and Antidiabetic Activities of *Melastoma malabathricum* Leaves Extracts. J Hunan Univ Nat Sci. 2022;49(7).
- Susanti, Deny. Phytochemical and Bioactivity Studies of *Melastoma malabathricum* L. and *Melastoma Imbricatum* Wall (Doctoral dissertation, Universiti Teknologi Malaysia). 2006.
- Khoo LT, Abas F, Abdullah JO, Mohd Tohit ER, Hamid M. Anticoagulant activity of polyphenolic-polysaccharides isolated from *Melastoma malabathricum* L. Evid Based Complement Alternat Med. 2014 Jan 1;2014.
- Wong KC, Hag Ali DM, Boey PL. Chemical constituents and antibacterial activity of *Melastoma malabathricum* L. Nat Prod Res. 2012 Apr 1;26(7):609-18.
- Ringmichon CL, Shimpi SN, Gopalkrishnan B. Ethnomedicinal investigation on *Melastoma malabathricum* Linn from Manipur. J Herb Med Toxicol. 2010;4(2):141-4.
- Parthana C, Rituraj B. A review on *Melastoma malabathricum* to enlist its morphological, pharmacological and phytochemical properties; c2023.
- Borghain A, Deka R. Botanical features of *Melastoma malabathricum* (Futukola plant)-a food plant of wild tasar silkworm in Assam; c2022.
- Sarmah R, Saikia A. Folklore medicine practiced by traditional healers of Fringe villages of Gibbon Wildlife Sanctuary, Assam, India. Acta Biomed Scientia. 2016;3(4):227-33.
- Kader MA, Rahman MM, Mahmud S, Khan MS, Mukta S, Zohora FT. A comparative study on the Antihyperlipidemic and antibacterial potency of the shoot and flower extracts of *Melastoma malabathricum* Linn's. Clin Phytoscience. 2023 Mar 1;9(1):5.
- Zakaria ZA, Raden M, Nor RNS, Hanan Kumar G, Abdul Ghani ZDF, Sulaiman MR, Rathna Devi G, Mat Jais AM, Somchit MN, Fatimah CA. Antinociceptive, anti-inflammatory and anti-pyretic properties of *Melastoma malabathricum* leaves aqueous extract in experimental animals. Can J Physiol Pharm. 2006;84:1291-9.
- Koh HL, Chua TK, Tan CH. Guide to medicinal plants, a: An illustrated scientific and medicinal approach. World Scientific; 2009 Feb 20.
- Wu ZY, Raven PH, Hong DY. Flora of China. Vol. 13 (Clusiaceae through Araliaceae).
- Ong HC, Nordiana M. Malay ethno-medico botany in Machang, Kelantan, Malaysia. Fitoterapia. 1999 Oct 1;70(5):502-13.
- Ong HC, Norzalina J. Malay herbal medicine in Gemencheh, Negri Sembilan, Malaysia. Fitoterapia. 1999 Feb 1;70(1):10-4.
- Wikipedia. *Melastoma malabathricum*. Available from: https://en.wikipedia.org/wiki/Melastoma_malabathricum.
- Wong W. *Melastoma malabathricum*: Too beautiful to be called a weed. Green Culture Singapore Feature Article for July. 2008:1-7.
- Faravani M, Bakar BB. Effects of light on seed germination, growth pattern of straits Rhododendron (*Melastoma malabathricum* L.). J Agric Biol Sci. 2007 May;2(3):1-5.
- Sari NM, Kuspradini H, Amirta R, Kusuma IW. Antioxidant activity of an invasive plant, *Melastoma malabathricum* and its potential as herbal tea product. In: IOP Conference Series: Earth and Environmental Science. 2018 Apr 1;144(1):012029.
- Zheng WJ, Ren YS, Wu ML, Yang YL, Fan Y, Piao XH, Ge YW, Wang SM. A review of the traditional uses, phytochemistry and biological activities of the *Melastoma* genus. J Ethnopharmacol. 2021 Jan 10;264:113322.
- Isnaini, Permatasari N, Mintaroem K, Widodo MA. Analysis of quercetin and kaempferol levels in various phase of flowers *Melastoma malabathricum* L. Int J Plant Biol. 2018 Oct 4;9(1):6846.
- Lee TH, Lee CH, Ong PY, Wong SL, Hamdan N, Ya'akob H, Azmi NA, Khoo SC, Zakaria ZA, Cheng KK. Comparison of extraction methods of phytochemical compounds from white flower variety of *Melastoma malabathricum*. S Afr J Bot. 2022 Aug 1;148:170-9.
- Suleiman D, Idris AM, Ibrahim UI. Review of Pharmacognostic Features, Phytochemical Constituents and Pharmacological Actions of *Melastoma malabathricum* LINN (Melastomaceae). Niger J Pharm Appl Sci Res. 2018;7(2):7-18.
- Mayasari D, Murti YB, Pratiwi SU, Sudarsono S, Hanna G, Hamann MT. TLC-based fingerprinting analysis of the geographical variation of *Melastoma malabathricum* in inland and archipelago regions: A rapid and easy-to-use tool for field metabolomics studies. J Nat Prod. 2021 Dec

- 29;85(1):292-300.
27. Sharma HK, Chhangte L, Dolui AK. Traditional medicinal plants in Mizoram, India. *Fitoterapia*. 2001 Feb 1;72(2):146-61.
 28. Rahmatullah M, Hossan MS, Hanif A, Roy P, Jahan R, Khan M, Chowdhury MH, Rahman T. Ethnomedicinal applications of plants by the traditional healers of the Marma tribe of Naikhongchhari, Bandarban district, Bangladesh. *Adv Nat Appl Sci*. 2009 Sep 1;3(3):392-401.
 29. Rahmatullah M, Mukti IJ, Haque AK, Mollik MA, Parvin K, Jahan R, Chowdhury MH, Rahman T. An ethnobotanical survey and pharmacological evaluation of medicinal plants used by the Garo tribal community living in Netrakona district, Bangladesh. *Adv Nat Appl Sci*. 2009 Sep 1;3(3):402-18.
 30. Rahmatullah M, Jahan R, Hossan MS, Seraj S, Rahman MM, Chowdhury AR, Miajee ZU, Nasrin D, Khatun Z, Jahan FI, Khatun MA. A comparative analysis of medicinal plants used by several tribes of Chittagong hill tracts region, Bangladesh to treat helminthic infections. *Adv Nat Appl Sci*. 2010 May 1;4(2):105-11.
 31. Elliott S, Brimacombe J. The medicinal plants of Gunung Leuser National Park, Indonesia. *J Ethnopharmacol*. 1987 May 1;19(3):285-317.
 32. Grosvenor PW, Gothard PK, McWilliam NC, Supriono A, Gray DO. Medicinal plants from Riau Province, Sumatra, Indonesia. Part 1: Uses. *J Ethnopharmacol*. 1995 Feb 1;45(2):75-95.
 33. Roosita K, Kusharto CM, Sekiyama M, Fachrurazi Y, Ohtsuka R. Medicinal plants used by the villagers of a Sundanese community in West Java, Indonesia. *J Ethnopharmacol*. 2008 Jan 4;115(1):72-81.
 34. Pattanaik C, Reddy CS, Murthy MS. An ethnobotanical survey of medicinal plants used by the Didayi tribe of Malkangiri district of Orissa, India. *Fitoterapia*. 2008 Jan 1;79(1):67-71.
 35. Lin KW. Ethnobotanical study of medicinal plants used by the Jah Hut peoples in Malaysia. *Indian J Med Sci*. 2005 Apr 1;59(4):156-61.
 36. Susanti D, Sirat HM, Ahmad F, Ali RM. Bioactive constituents from the leaves of *Melastoma malabathricum* L. *J Ilm Farm*. 2008;5(1).
 37. Alnajar ZA, Abdulla MA, Ali HM, Alshawsh MA, Hadi AH. Acute toxicity evaluation, antibacterial, antioxidant and immunomodulatory effects of *Melastoma malabathricum*. *Molecules*. 2012 Mar 20;17(3):3547-59.
 38. Zakaria ZA, Rofiee MS, Mohamed AM, Teh LK, Salleh MZ. *In vitro* antiproliferative and antioxidant activities and total phenolic contents of the extracts of *Melastoma malabathricum* leaves. *J Acupunct Meridian Stud*. 2011 Dec 1;4(4):248-56.
 39. Mamat SS, Kamarolzaman MF, Yahya F, Mahmood ND, Shahril MS, Jakius KF, *et al*. Methanol extract of *Melastoma malabathricum* leaves exerted antioxidant and liver protective activity in rats. *BMC Complement Altern Med*. 2013 Dec;13:1-2.
 40. Khan MM, Harunsani MH, Tan AL, Hojamberdiev M, Azamay S, Ahmad N. Antibacterial activities of zinc oxide and Mn-doped zinc oxide synthesized using *Melastoma malabathricum* (L.) leaf extract. *Bioprocess Biosyst Eng*. 2020 Aug;43:1499-508.
 41. Mazura MP, Susanti D, Rasadah MA. Anti-inflammatory action of components from *Melastoma malabathricum*. *Pharm Biol*. 2007 Jan 1;45(5):372-5.
 42. Anbu J, Jisha P, Varatharajan R, Muthappan M. Antibacterial and wound healing activities of *Melastoma malabathricum* linn. *Afr J Infect Dis*. 2008;2(2).
 43. Manicam C, Abdullah JO, Tohit EM, Seman Z, Chin SC, Hamid M. *In vitro* anticoagulant activities of *Melastoma malabathricum* Linn. aqueous leaf extract: A preliminary novel finding. *J Med Plants Res*. 2010 Jul 18;4(14):1464-72.
 44. Havagiray RC, Ramesh C, Sadhna K. Studies on anti-diarrhoeal activity of *Calotropis gigantea* R.Br in experimental animals. *J Pharm Pharmaceut Sci*. 2004;7:70-75.
 45. Karuppasamy Balamurugan KB, Antony Nishanthini AN, Mohan VR. Anti-diarrheal activity of *Melastoma malabathricum* L. leaf extracts (Melastomataceae); c2013.