International Journal of Pharmacy

www.ijpjournal.org

e-ISSN: 2249 – 7684
Print ISSN: 2249 – 7692

Medicinal value of *Merremia tridentata* (L.) Hallier. f. (Convolvulaceae) – A Pharmacognostic Approach

S.K. Neyanila, G. Prakash Yoganandam*, V. Gopal

Mother Theresa Post Graduate and Research Institute of Health Sciences, Gorimedu, Puducherry - 605 006, India.

★★★★★★★★★★

ABSTRACT

Merremia tridentata (L.) Hallier. f. is the perennial herb with elongate stems belonging to the family Convolvulaceae, and is distributed in the tropical parts of the world. The plant is used in traditional medicine to cure many diseases such as arthritis, skin infections, inflammation, fever, diabetes, diarrhea, urinary disorders, and also used to improve hair growth. Flavanoids have been isolated from the aerial parts of the plant which include diosmetin, luteolin, diosmetin–7–o–β–d–glucoside, luteolin–7–o –β–d–glucoside. The plant reported to possesses anti-diabetic, anti- inflammatory, anti-arthritis, wound healing, analgesic and anti-microbial activities. An overview of the ethnobotanical, phytochemical and pharmacological investigations on the plant *is* presented in this review.

Key words: *Merremia tridentata* (L) Hallier. f. Convolvulaceae, Flavonoids.

★★★★★★★★★★

INTRODUCTION

Merremia tridentata (L.) Hallier. f. commonly known as "Mudiyarkunthal"or "Savalikodi" or "Thrippan pullu" in tamil and "Prasarini" in Sanskrit is reported to possess a number of medicinal values. It is a perennial herb with a small woody root stock, belonging to the family Convolvulaceae. Widely distributed in tropical, subtropical and temperature region [1]. Convolvulaceae is also known as the morning glory family and has 58 genera and 1650 species. Out of which 15 genera and 150 species were recorded in india, 20 genera and 129 species in china and 80 species in tropical regions of Africa, Asia, Australia, North and south America. A phytochemical screening of 19 genera and 59 species showed the presence of flavonoids, quinines, phenolic acids, saponins [7] etc., The plant is considered bitter, astringent, tonic and used in the treatment of rheumatism, swelling, urinary disorders and the decoction of the root is used for anti-diabetics [2]. According to survey, traditional uses of medicinal plants among the rural people in Sivagangai district and ethnomedicinal plants used by kanikkars of agasthiarmalai biosphere reserve, Western Ghats, concluded that *Merremia tridentate* used to improve hair growth [3-5]. Present attempt was made to review and compile the total information up-to-date on various aspects of *Merremia tridentata* (L.) Hallier. f.

Scientific classification

Kingdom	: Plantae
Subkingdom	: Tracheobionta
Super division	: Spermatophyta
Division	: Magnoliophyta
Class	: Magnoliopsida
Subclass	: Asteridae
Order	: Solanales
Family	: Convolvulaceae
Genus	: *Merremia*
Species	: *Tridentata (Linn.) Hallier f.*

Corresponding Author:- **G.Prakash Yoganandam** Email:- gprakashyoga@gmail.com

Vernacular Name

English : Arrow-leaf Morning Glory
Hindi : Prasarini
Tamil : Muthiyor koonthal, Kuthirai vaali
Malayalam : Talaneeli, Talanili
Telugu : Sitasavaram .
Marathi : Morga.
Konkani : Semdar Kalaud.

Regional Name

Malaysia : Akar keremak, karok relia, pungulang.
Indonesia : Irit-iritan, rangitan (Javanese), jala ma tubu.
Thailand : Thao tot maa (South-western).
Philippines : Maragta, talanuk (Tagalog), karadkad (Igorot) [1-3].

Botanical description

Merremia tridentata (L.) Hallier. f. is an annual or perennial herbs or shrubs, usually twining, but also prostrate and rooting at the nodes, erect herbs or low, erect shrubs; sometimes with tuberous roots. Leaves alternate, variable in size and shape, entire, dentate, lobed or palmately or dentately partite or compound; petiole present; stipules absent. Inflorescence axillary, few- to many-flowered, variously ramified, large to small; peduncle present to almost absent; bracts usually small. Flowers bisexual, regular, small to large, pedicel present; sepals 5, usually subequal, often somewhat enlarged in fruit; corolla funnel-shaped or campanulate, slightly 5-lobed, mid-petaline bands well-defined, white, yellow to orange; stamens 5, inserted near the base of corolla tube, included, filaments often unequal in length, anthers often contorted, pollen glabrous; ovary 2-4 celled, with 4 ovules, style 1, simple, filiform, included, stigma 2-globular. Fruit a globose or ovoid capsule, 4-valved, 4-seeded. Seed glabrous, pubescent or villose, especially at the margins. Seedling with epigeal germination; cotyledons often deeply divided into lobes or slips.

Plant Habit

Habitat : Hill plant, Plain land
Plant type : Herb
Foliage : Evergreen
Roots : Shallow roots, Tap roots
Type of stem : Non woody
Leaf type : Linear, oblong, Obovate
Leaf color : Green
Plant feature : Creeper, Hill side plant spreading
Plant utilities : Fodder crop, Industrial/commercial, Medicinal plant
Season : Perennial

Fruit characteristics

Type of fruit : True fruit
Fruit classification : Capsule, Dehiscent fruit, Dry fruit, Simple fruit
Seeds : Many, Two seeded

Flower characteristics

Flower colour : Yellow
Flower type : Hermaphrodite

Ecology & Distribution

History of cultivation

Merremia tridentata (L.) Hallier. f.grows on disturbed sites such as roadsides, grasslands, cultivated areas, and along forest borders, sometimes covering entire shrubs and trees. *Merremia* species are mainly cultivated and trade on a local scale, for medicinal purposes.

Cultivation information

Climatic conditions

Temperature (°C) : 10-15, 35-40, 25-30
Rainfall (mm) : 500-1500
Altitude (m) : 100-750
Climate : Hot climate
Sunlight : Full sun, Partial shade.
Wind velocity : Resistant to heavy wind

Soil Features

Soil type : Alluvial soil, Black soil, Sandy loam
Drainage : Well drained
Soil depth (m) : 0.15-0.5

Propagation information

Time of propagation : Monsoon
Propagation method : Propagated by seed, sometimes from stem cuttings.

Ethnobotanical information

The plant *Merremia tridentata* (L.) Hallier. f. have been used by the tribes in various parts of India, Bihar, Orissa , Srilanka, Western penisula.

Whole plant

The entire plant is boiled in coconut oil and the extract is used to treat dandruff and to promote hair growth. About 10 grams of the leaves made into a paste is applied once in a day to treat various skin infections by kanikkars of agasthiarmalai biosphere reserve, Western Ghats [5]. The plant is macerated and steeped for a week to make a wash for infants with malaria in Tanzania [11].

Leaves

The fresh leaf paste is used by rural people in Sivagangai district to improve the growth of the hair[4].The oil extract of leaf used to treat dandruff and skin infections in Kanniyakumari district of Western Ghats [8]. Leaves of the plant used in the treatment of herpes in the ethno-

medicine of coastal Karnataka [10]. The leaves of plants are reputed active against snake bite venom [12,23].

Root

The root decoction is used to treat urinary disorders in Gangaraju Madugula Mandal of Visakhapatnam district, Andhra Pradesh [9]. Decoction of root is taken orally once a day for 30-45 days to cure diabetes in Sivagangai districts, Tamil Nadu [4].

Phytochemistry

Flavonoids

Flavonoids, are important class of phenolics featuring the linkage of two benzene rings by a chain of 3 carbon atoms so as to form pyran or pyrone ring, play a predominant role in plant physiology and serve as light screens, antioxidants, enzyme inhibitors, precursors of toxic substances, and pigments. The ethanolic root extracts of the plant *Merremia tridentata* (L.) Hallier. f. was subjected to fractionation by using petroleum ether (60-80^{o}), ethyl acetate, butanone, and butanol in succession. The individual fractions were subjected to various chemical tests for sterols, triterpenoids, glycosides, saponins, carbohydrates, alkaloids, flavonoids, tannins, and proteins for detection of chemical group. The results of qualitative chemical tests revealed the presence of flavonoids in solvent ethyl acetate, butanol, and butanone fractions. The chemical identity of the compound was ascertained by using TLC, UV-visible spectroscopy and IR-spectroscopic studies [16]. Four Flavanoids have been isolated from the aerial parts of the plant which include diosmetin, luteolin, diosmetin–7–o–β–d–glucoside, luteolin–7–o- β–d–glucoside [22].

Pharmacological Properties

Wound healing activity

The root of *Merremia tridentata* (L.) Hallier. f. was evaluated for its wound healing activity in male albino rats in dead space and excision wound model. The activity was more significant for ethyl acetate, butanone, and butanol than petroleum ether when compared to standard at a dose of 200mg/kg body weight. The phytochemical investigation revealed the presence of flavonoids and these properties can be attributed to the presence of flavonoids [16].

Anti-inflammatory activity

The leaf and root of *Merremia tridentata* (L.) Hallier. f. was reported to have anti-inflammatory activity. Significant anti-inflammatory effect against histamine-induced inflammation and carrageenin induced paw edema model [14], which is observed in the solvent ethyl acetate, butanol, butanone fractions when compared to control whereas it was insignificant for petroleum ether at a dose of 200 mg/kg body weight [15].

Analgesic activity

The acetone root extract of *Merremia tridentata* (L.) Hallier. f. was evaluated for analgesic activity by the method of acetic acid induced writhing in mice and hot plate test in mice. It showed highest analgesic activity at a dose of 200 mg/kg than standard drug Pentazocine (30 mg/kg) in hot plate test. It also showed good analgesic activity against acetic acid induced writhing in mice at a dose of 100mg/kg when compared with standard drug acetyl salicylic acid (10mg/kg b. wt.) [15].

Anti-diabetic activity

The aqueous root extract of *Merremia tridentata* (L.) Hallier. f. investicated for antidiabetic activity by oral administration at the doses of 50, 100, and 150 mg/kg in normal, glucose-loaded and STZ-diabetic rats. The three doses caused significant reduction in blood glucose levels in all the models when compared with glibenclamide. It also showed significant increase in serum insulin, body weight and glycogen content in liver and skeletal muscle of STZ-induced diabetic rats while there was significant reduction in the levels of serum triglyceride and total cholesterol [13].

Anti-arthritic activity

The ethanolic extract of whole plant *Merremia tridentata* (L.) Hallier. f. was evaluated for its anti-arthritic activity in freund's adjuvant induced arthritis model in male albino rats. The ethanolic extract of plant showed significant activity in doses of 100, 200 mg/kg b. wt [14,20]. Comparative Study of Prasarani [*Merremia tridentate (L.)* Hallier.f. (Convolvulaceae) and *Paederia foetida* Linn. (Rubiaceae)] in Amavata (Rheumatoid Arthritis) is concluded that the plant *Merremia tridentata (L.)* Hallier.f. has better effect and little more advantage over the plant *Paederia foetida* Linn. Which possess offensive odour which can be not reduced fully even after boiling [21].

Anti-microbial activity

The methanolic extract of *Merremia tridentata* (L.) Hallier. f. was evaluated for its anti-microbial activity. The extracts are found to be more effective against gram – positive bacteria (*Bacillus subtilis, Staphylococcus aureus)* than gram- negative bacteria[17]. Methanol extract showed MIC 0.25 to 100 mg /ml against bacterial pathogens and MIC 0.5 to 100 mg /ml against fungal pathogens [24].

Anti-oxidant

The anti-oxidant activities of aerial parts and root of plant was evaluated by measuring the ability of the extracts to scavenge the DPPH, ABTS, and OH. In addition, the reducing power, phosphomolybdenum reduction, Fe^{2} chelation, antihemolytic activity, and inhibition of peroxidation were also assessed. The acetone extract of roots possessed significant free radical

scavenging and antioxidant properties whereas the hot water extract of aerial parts exhibited the maximum iron chelation. It was clearly suggest that *M.tridentata* is a natural source for antioxidant [18].

Veterinary medicine

In veterinary medicine *Merremia tridentata* (L.) Hallier. f. is proved as a supplementary feed to the *grass panicum* maximum for young west African dwarf sheep. It was found that protein content of *Merremia tridentata* was higher than that of the *grass* and its tannin content was not sufficient to render it unpalatable [19,24].

Fig.1 *Merremia tridentata* with flowering twig, fruits and flower

Fig 1. Diosmetin 5,7,dihydroxy-2-(3-hydroxy-4 methoxyphenyl chromen-4-one

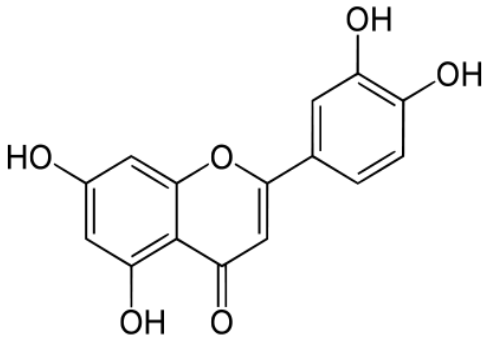


Fig 2. Bottom of Form luteolin 7-O-beta-D-glucoside 7-(β-D-glucopyranosyloxy)-5-hydroxy-2-(3,4-dihydroxyphenyl)-4H-chromen-4-one

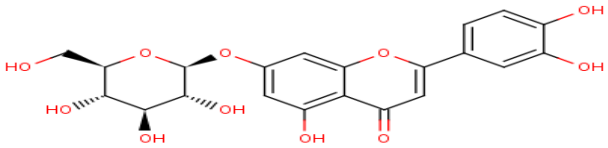


Fig 3. Luteolin 2-(3,4-Dihydroxyphenyl)- 5,7-dihydroxy-4-chromenone

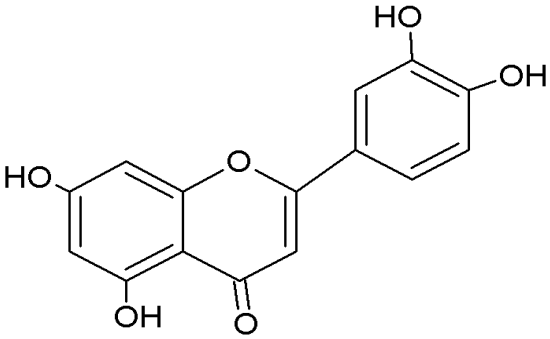
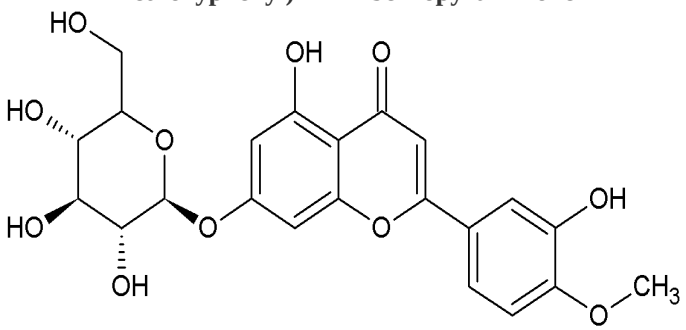


Fig 4. Diosmetin-7-O-Beta-D-Glucoside Glucopyranosyloxy)-5-hydroxy-2-(3-hydroxy-4-methoxyphenyl)-4H-1-benzopyran-4-one



CONCLUSION

The significance can be made on the basis of this comprehensive perusal of literature of the plant *Merremia tridentata* (L.) Hallier. f. belonging to the family convolvulaceae being used traditionally due to their immense therapeutic potential to treat/cure various diseases. The presence of flavonoids in the plant exhibit significant biological activities. The above studies demonstrated that the plant has significant anti-inflammatory, analgesic, wound healing, anti-microbial, anti-arthritic and anti-diabetic activities. In veterinary it is proved as a supplementary feed to the *grass panicum* maximum for young West African dwarf sheep. This kind of work may pave pathway to select or choose *Merremia tridentata* (L.) Hallier. f. to develop as a herbal medicine.

REFERENCES

1. Chopra RN, Nayar SL and Chopra IC. Glossary of Indian medicinal plants, council of scientific and industrial research, New Delhi, 1995, 330**.**
2. The wealth of India. A dictionary of raw materials and industrial products. New Delhi; 1962, 342-349
3. Kirtikar KR, Basu BD. Indian medicinal plants, lakit mohan basu, Allahabad; 1935, 1964-1966
4. Shanmugam S, Rajendran K, Suresh K. Traditional uses of medicinal plants among the rural people in Sivagangai district of Tamilnadu, southern India. *Asian Pacific Journal of Tropical Biomedicine*, 2012, s429-s434.
5. Lalitha Rani S, Kalpanadevi V, Tresina Soris P, Maruthupandian A, Mohan VR. Ethnomedicinal plants used by Kanikkars of Agasthiarmalai Biosphere Reserve, Western Ghats. *Journal of Ecobiotechnology*, 3(7), 2011, 16-25.
6. Krishnappan AL, Seetharaman TR. Flavanoids of *merremia tridentate*. *Fitoterapia*, 63(2), 1992, 190.
7. Geetha G Nair. Taxonomic Relationships and Ethnobotany of family Convolvulaceae. *International Journal of Basic and Applied Chemical Sciences*, 2(3), 2012, 56-81.
8. Palanichamy Chendurpandy., Veerabahu Ramasamy Mohan., and Chinnamadasamy Kalidass., An Ethnobotanical Survey of Medicinal Plants Used by The *Kanikkar* Tribe of Kanyakumari District of Western Ghats, *Tamilnadu for The Treatment of Skin Diseases*, 4(1), 2010, 179-190.
9. Lenin Babuji J, Venkat Ratnam S. Traditional Uses of Some Medicinal Plants by tribals of Gangaraju Madugula Mandal of Visakhapatnam District, Andhra Pradesh. 13, 2009, 388-98.
10. Bhadary MJ, Chadrashekar KR. Herbal Therapy for Herps in the Ethno-Medicine of Coastal Kaarnataka. 10(3), 2011, 528-532.
11. Fowler DG. Traditional Fever Remedies: a List of Zambian Plants. 2009.
12. Walter B. Mors, Maria Celia Do Nascimento, Bettina M, Ruppelt Pereira, Nuno Alvares Pereira. Plant Natural Products active Against Snake bite. *The Molecular Approach*, 55, 2000, 627-642.
13. Arunachalam K, Parimelazhagan T. Antidiabetic activity of aqueous root extract of *Merremia tridentate* (L.) Hall. F. in Streptozotocin-Induced- Diabetic Rats. *Asian Pac J Trop Med*, 5(3), 2012, 175-9.
14. Kamalutheen M, Gopalakrishnan S, Syed Ismail T. Anti-inflammatory and Anti-arthritic Activities of *Merremia tridentate* (L.) Hall. F. *E-Journal of Chemistry*. 6(4), 2009, 943-948.
15. Arunachalam K, Parimelazhagan T, Manian S. Analgesic and Anti-inflammatory Effects of *Merremia tridentate* (L.) Hall. F. *International Journal of Pharmacy and Pharmaceutical Sciences*, 5(3), 2011.
16. Bidkar AA, Sherje AP, Gujar KN, Bagul US, Miniyar PA, Aphale SA. Phytochemical and Pharmacological Investigation of Extracts of *Merremia tridentata* Linn. (Convolvulaceae). *Journal of Natural Remedies*, 9(1), 2009, 79-84.
17. Kaladhar DSVGK, Harashreeramulu S, Vijaya Rachel K, and Surekha. CH., Evaluation of Anti-microbial activity of Methanolic Leaf Extracts of Selected *in-vitro* and *in-vivo* Grown Convolvulaceae Members. *JPAM*, 3(2): 759-767.
18. Kandhasamy Sowndharajan., Jince Mary Joseph., Karuppusamy Arunachalam., Sellamuthu Manian., Evaluation of *merremia tridentate* (L.) Hallier. F. for *in-vitro* Antioxidant activity. *Food Science and Biotechnology*, 19(3), 2010, 663-669.
19. Aschfalk A, Steingass H, Muller W, Drochner W. *Merremia tridentate* as a Supplimentary Feed to the *Grass Panicum* Maximum for Young West African Dwarf Sheep. *Trop Anim Health Prod*, 34(2), 2002, 145-50.
20. Vivek K. Baranwal Irchhaiya R, Shashi Alok. Antiarthritic Activity of Some Indigenous Plants: A Re view. *International Journal of Pharmaceutical Sciences and Research*, 5(3), 2012.
21. Rajashekhara N, Sharma PP, Vasanth P. Comparative Study of Prasarani [*Merremia tridentata (L.)* Hallier.f. (Convolvulaceae) and *Paederia foetida* Linn. (Rubiaceae)] in Amavata (Rheumatoid Arthritis). *Ayu*, 5(30), 2009, 503-507.
22. Krishnappan AL, Seetharaman TR. Flavonoids of *merremia tridentata (L.)* Hallier.f. *Fitoterapia*, 63(2), 1992, 190.
23. Gupta YK, Peshin SS. Do Herbal Medicines Have Potential for Managing Snake Bite Envenomation. *Toxicology International*, 19(2), 2012.
24. Pavithra PS, et al. Antibacterial activity of Plants used in Indian Herbal Medicine. *International Journal of Green Pharmacy*, 2010, 223-234.