

Meyna spinosa Roxb.: An unexplored ethnomedicinal plant

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Abstract

Traditional and folk remedies are known to mankind for thousands of years and continue to be the source of new medicines in future. *Meyna spinosa* Roxb., belonging to the family Rubiaceae, is a promising folk medicinal plant of India. The plant is distributed in the North Eastern and Southern part of India, Bangladesh, China, Myanmar, and Malaya. This plant has a long history of use in folk medicine, especially among the different tribes and ethnic people of India. *M. spinosa* traditionally been used for the treatment of skin infection, headache, diabetes, hepatic disorder, dysentery, indigestion, intestinal worm, and painful urination. It is also important for its abortifacient activity. In spite of its huge ethnomedicinal use very few phytochemical and pharmacological investigations have been carried out on *M. spinosa*. The plant parts have been investigated for antioxidant, antimicrobial, antidiabetic, cytotoxic, hepatoprotective, and nephroprotective activity. Few flavonoids, triterpenes, phytosterols, hydroxy acid, and fatty alcohol are isolated from the plant. The present article includes details exploration of morphology, taxonomy, folk medicinal use and pharmacological and phytochemical aspects of *M. spinosa* in an attempt to provide a direction for future research.

Key words: Ethnomedicinal plant, India, *Meyna spinosa*, Rubiaceae

INTRODUCTION

Traditional and folk medicine especially from plant sources had a glorious past and promising future. In spite of the vast potential and traditional uses a large number of plants are not documented and investigated properly. Proper ethnobotanical survey and documentation of ethnomedicinal uses are necessary for new drug discovery and to address intellectual property right issues properly.^[1] Rubiaceae was identified as the fourth largest plant family, with 13143 species, classified into 611 genera till 2009.^[2] Plants from Rubiaceae family have diverse traditional and modern medicinal uses. *Meyna* is a genus of Rubiaceae family which includes shrub or small trees distributed in the tropical and subtropical regions of the world. About 11 species of *Meyna* are distributed in topical Asia to South East Asia, two or three species are found in India.^[3,4] *Meyna spinosa* is one of the spices which distributed in India and neighboring countries commonly and have wide ethnomedicinal use. According to old documents, *Vangueria spinosa* Fl. Br. Ind. covers a group of plants, but recently the plants has been separated and grouped into several species of *Meyna* including *M. spinosa* and *Meyna laxiflora*. *M. spinosa* is closely related with *M. laxiflora*.

Flowers of *M. spinosa* are crowded into fascicles and have shorter pedicels and petioles than the flowers of *M. laxiflora*. But many researchers consider these species as inseparable.^[3] Therefore, earlier several researchers had considered *V. spinosa* as a synonym of *M. spinosa*, while other authors have used *V. spinosa* as a synonym of *M. laxiflora*.^[5-9] The present article includes details exploration of morphology, taxonomy, folk medicinal use, and pharmacological aspects of *M. spinosa*. We have also included the details of ethnomedicinal use and pharmacological investigations carried out on *V. spinosa* and *M. laxiflora* as the previous researchers have described *V. spinosa* as a synonym of both *M. spinosa* and *M. laxiflora*.

BOTANICAL DESCRIPTION

M. spinosa is a spiny, usually armed small tree or large shrub about 5-8 m tall. Branches are busy, bark dark-colored, nearly

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smooth. Spines are axillary or supra axillary, straight, sharp, 5-40 mm. Leaves are membranous, ovate or elliptic-oblong, 4-15 cm × 2.5-5 cm, slightly pubescent above, densely pubescent beneath, apex bluntly or obtusely acuminate, margin entire, base rounded or acute; secondary nerves 7-9 pairs, tertiary nerves prominent below; petiole to 1 cm, densely hairy; stipules short, broad, very obtuse, caduceous. Flowers of the plant crowded into fascicles and have shorter pedicels and petioles. Flowers are small, 4-5 merous, pale green or greenish white with faintly fragrant on short pedunculate axillary cymes, calyx 5 toothed corolla 5 lobes. Fruits are yellowish, subglobose drupe, smooth with persistent calyx lobes. *M. spinosa* flowers are crowded into fascicles and have shorter pedicels and petioles than the *M. laxiflora* flowers. Flowers are seen in generally in the month of April and May; while fruits can be seen in August to December.^[4,7,10]

Vernacular name in different Indian language includes Moin-tenga (Assamese), Mankatha (Bengali), Maina (Hindi), Lam heibi (Manipuri), Halawni (Marathi), Montapoo (Oriya), Pindituka (Sanskrit), Manakkarai (Tamil), and Segga Gadda (Telugu) [Figure 1].^[10]

HABITAT

Plant is commonly distributed in North East India (Tripura, Arunachal Pradesh, Manipur, Assam, Meghalaya, Mizoram, and Nagaland), Eastern state of India such as West Bengal and South India (Andhra Pradesh, Karnataka, and Tamil Nadu). Plant is also available in Bangladesh, China, Myanmar, and Malaya.^[4]

TAXONOMICAL CLASSIFICATION^[10]

Kingdom: Plantae
Habitat: Mesophyte
Phylum: Magnoliophyta
Class: Magnoliopsida
Order: Rubiales
Family: Rubiaceae
Genus: Meyna
Species: *Spinosa* Roxb. ex Link
Scientific name: *Meyna spinosa*

ETHNOMEDICINAL USES

In variety of traditional medicinal preparations the plant parts are used to cure numerous diseases. Fruits of the plant are used as food.

Headache and Hair Washing

M. spinosa is used widely by Nyishi community of Arunachal Pradesh, India, for medicinal purposes. Fruits and bark of

the plant are used to cure headache and also in washing of hairs.^[11] The leaf paste is also used as shampoo.^[12]

Abortifacient Activity

Abortifacient effect of the plant is well known among different tribes of India. Seed paste with water also used as abortifacient by the rural people in Tinsukia district, Assam, India.^[6] Fruits and seed of the plant are used by Polia tribes of West Bengal (India) to induce abortion. Seeds and pulp of ripe fruits made into paste with 2-3 bulb of *Allium sativum* and 2.5 g of Hing (*Ferula asafoetida*), which used to prepare the abortifacient pills. These pills kept inside overnight to induce abortion up to 2 months of pregnancy.^[13] Tribes of Andhra Pradesh (India) also use this plant for its abortifacient activity. The mode of preparation and application is same except the use of Hing as described above.^[14]

Antidiabetic Activity

Boiled extract of fruits is used to cure diabetes by Meitei and Meitei-pangal communities in Thoubal district, Manipur, India.^[15]

Treatment of Skin Infection and Pimples

Tender leaves of the plant are used to treat skin irritation by Tribes of Tripura, India. Tender leaves (40-50 g) are crushed with little amount of ginger or turmeric and paste is rubbed on the infected area of the skin.^[16,17] Ripe fruits of *M. spinosa* are crushed and rubbed on cracked heels for quick healing, while seed paste is applied on skin to cure pimples.^[5]

Treatment of Jaundice and Hepatic Disorders

Plant shoots are used traditionally for the treatment of jaundice in Assam, India.^[10] Fruits are believed to have cholagogue property. Fruit decoction of *M. spinosa* used in the cure of biliary complaints with hepatic congestion.^[4] Ripe fruit is used by the tribes of Tripura, India, to cure liver disorder.^[16] Dried fruits are taken traditionally to treat piles.^[12]

Treatment of Peptic Ulcer

Tribes of Tripura (India) use the plant to cure of peptic ulcer and hepatic disorder. Extract of the leaf is found effective to cure peptic ulceration.^[16]

Treatment of Dysentery, Indigestion, Intestinal Worm, and Painful Urination

Plant is useful in the treatment of dysentery, indigestion, intestinal worm, and painful urination by different groups in India. About 15 ml of plant decoction is used to cure

dysentery by Lodhas community. Santals prescribe root paste (about 5 g) against painful urination. Dried leaf powder of the plant with turmeric rhizome (3:1) made into paste and used in the removal of intestinal worm by Oraons.^[10] Lodhas use leaf juice/decoction with common salt (3:2) to cure indigestion. Leaf powder is also useful in the treatment of dyspepsia in Tripura.^[10,18]

Treatment of Tetanus, Cancer

Santal prescribes root bark decoction about 10 ml for the treatment of tetanus. Ripe fruit paste are used in the treatment of stomach cancer by ethnic communities of Tinsukia, Assam (India).^[10,12]

Treatment of Cough, Scorpion-Sting and as Refrigerant, Nutrients

Fruits are a good source of nutrient and used to cure cough in Tripura (India) traditionally.^[18] The plant is used in scorpion sting and fruits of the plant are used as nutrients refrigerant traditionally.^[16]

M. laxiflora seed powder is mixed in water thoroughly and administered twice a day for 10-15 days to treat kidney stone in Nasik district of Maharashtra, India.^[19] Plant is also important for its uses in the treatment of gastrointestinal disorder by tribes of Northwestern region of Maharashtra. Leaves of *M. laxiflora* are chewed for abdominal distension.^[20] Ripe fruit of the plant also used to prepare alcoholic beverage in Meghalaya, India.^[21] Dried fruits of *M. laxiflora* believed to have narcotic property and used in the treatment of boils and dysentery. Powdered leaf of the plant used in diphtheria.^[3,8]

PHYTOCHEMICAL STUDIES

Phytochemical study showed that the ripe fruit pulp of *V. spinosa* contain phenolic components, condensed tannin, while alkaloid was absent in fruit pulp.^[22] Presence of a flavonoid (-)-epicatechin-3-O- β -glucopyranoside (1) in leaves of *V. spinosa* was reported.^[23] Oleanolic acid (2) was isolated from the fruits of *M. spinosa*.^[24] Chemical investigation of *M. laxiflora* leaves also showed the presence of different triterpenoid, saponin.^[25,26] Leaves of *M. spinosa* found to contain significant amount of total phenolic and total flavonoid. A flavonoid (2-[3-cyclopropyl-4-hydroxyphenyl]-5,7-dihydroxy-4-oxo-4H-chromen-3-yl acetate) (3) was isolated from the *M. spinosa* leaves.^[27] Methanol extract of *M. spinosa* leaves shows the presence of 19 α -hydroxyasiatic acid (4), oleanolic acid (2), myricyl alcohol (5), β -sitosterol (6), and 3-O- β -D-glucopyranosyl- β -sitosterol (7). Three new compounds, namely, 19 α -hydroxyursane-type triterpenes, (2 α ,3 α ,19 α ,24,28-pentahydroxyurs-12-ene) (8), meyanthic acid (3 β -acetoxy-2 β ,19 α ,23-trihydroxyurs-12-en-28-oic

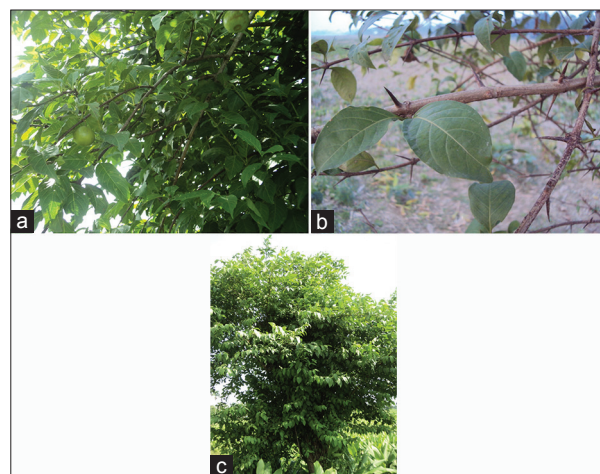


Figure 1: Different parts of *Meyna spinosa* Roxb. (a) *M. spinosa* fruits, (b) a branch of the plant with spines, (c) whole plant

acid) (9) and a aliphatic ester, and myricyl pentadecanoate (10) were isolated from the plant leaves [Figure 2].^[28]

BIOLOGICAL STUDIES

Antimicrobial Activity

Antifungal activity of methanol extracts *M. spinosa* was investigated. Antimicrobial assay was done by agar well diffusion method against *Candida albicans*. Antimicrobial activity of the extract was compared with commercially used antibiotic clotrimazole.^[29] Aswal *et al.* have investigated the antiprotozoal (against *Entamoeba histolytica*), antiviral (against *Ranikhet disease virus*, *Vaccinia virus*, and *Semliki forest virus*) activity of *M. spinosa* extract (except root), but did not find any significant result.^[30] Two compounds were isolated from the fruits of *M. spinosa* and antimicrobial effect of these compounds was assessed on several microbial stain including *Bacillus subtilis*, *Klebsiella pneumoniae*, *Escherichia coli*, *Staphylococcus aureus*, and *C. albicans*. Oleanolic acid isolated from the fruit exhibited high antimicrobial activity against all the test organisms. Antibacterial activities of the aqueous and methanol extracts of the dried leaves of *V. spinosa* were carried out by the disk diffusion method against four bacterial strains, namely, *S. aureus*, *B. subtilis*, *E. coli*, and *Pseudomonas aeruginosa*. Both the aqueous and the methanol extracts of *V. spinosa* showed the strongest bactericidal activity.^[23,31] Stem of the plant also possess antibacterial activity.^[32] Significant *in vitro* antibacterial activity of ethanol extract of *V. spinosa* leaf was reported when used alone and in combination with doxycycline and ofloxacin against one Gram-positive and three Gram-negative bacteria. Significant antibacterial activity of the plant was also reported against *K. pneumoniae*, *E. coli*, *S. aureus*, and *P. aeruginosa*.^[33] A flavonoid fraction of

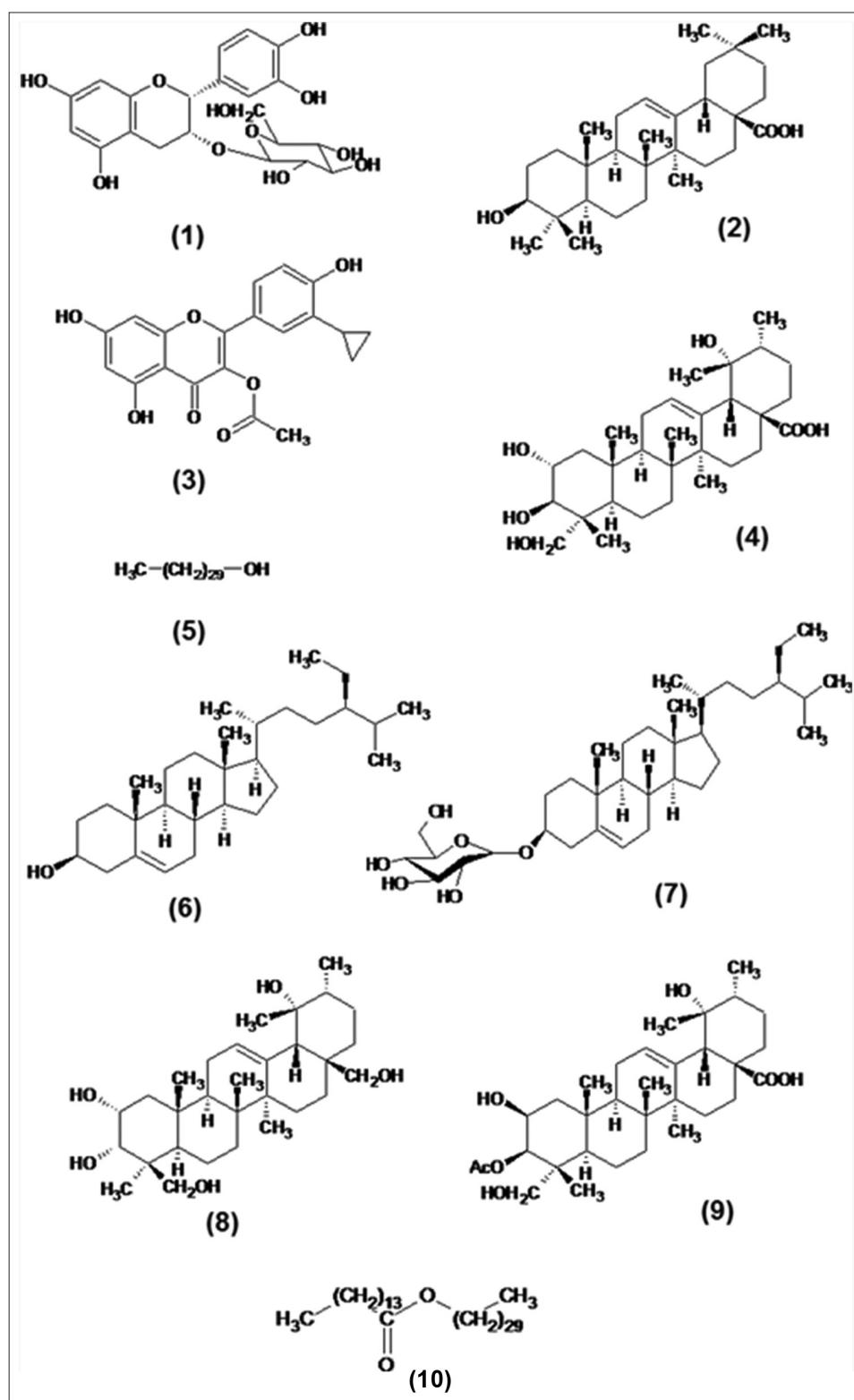


Figure 2: Structure of compounds isolated from *Meyna spinosa* [(-)-epicatechin-3-O-β-glucopyranoside (1); Oleanolic acid (2); 2-(3-cyclopropyl-4-hydroxyphenyl)-5,7-dihydroxy-4-oxo-4H-chromen-3-yl acetate (3); 19 α-hydroxyasiatic acid (4); myricyl alcohol (5); β-sitosterol (6); 3-O-β-D-glucopyranosyl-β-sitosterol (7); 19α-hydroxyursane-type triterpenes (8); meyanthic acid (9); myricyl pentadecanoate (10)]

V. spinosa leaves which was identified as (-)-epicatechin-3-O-β-glucopyranoside showed potent antibacterial effect against *S. aureus*, *E. coli*, *K. pneumoniae*, and *P. aeruginosa*.^[23]

Antioxidant Activity

Antioxidant activity of methanol, ethanol and petroleum ether extract of *M. spinosa* and their different fractions were

investigated through different *ex vivo* (inhibition of lipid peroxidation and oxidative hemolysis) and *in vitro* method (2,2'-diphenyl-picrylhydrazyl radical, superoxide anion, hydroxyl radical, nitric oxide radical and hydrogen peroxide scavenging activity, metal chelating assay, reducing power ability, and total antioxidant activity). Methanol extract produced the highest activity.^[34,35]

Antioxidant activity of *M. laxiflora* fruits was investigated. Methanolic extract of the fruit showed significant antioxidant activity evaluated by (2,2-diphenyl-1-picryl-hydrazyl-hydrate) method.^[36] Antioxidant activity of ethanol extract of *M. laxiflora* seed has been evaluated for *in vitro* method. The extract possess significant free radical scavenging activity.^[37]

Hepatoprotective, Nephroprotective, and Antidiabetic Evaluation

Methanol, ethyl acetate fraction of *M. spinosa* leaf methanol extract produced antidiabetic activity at a dose of 75 and 150 mg/kg, p.o. against high fat diet-alloxan induced Type 2 diabetic rats after 21 days.^[38] These fractions also showed significant protective effect paracetamol induced liver damage and cisplatin induced nephrotoxicity.^[10]

Cytotoxic Activity

Ethanol extract of *M. spinosa* stem evaluated for cytotoxic activity using brine shrimp lethality bioassay method. LD₅₀ of extract was found to be 40 µg/ml.^[32]

CONCLUSION

Modern civilization, industrialization, pollution, rapid rise in population, and unscrupulous collection of medicinal plants from wild habitats leads decrease and has threatened the very existence of valuable medicinal plant resources. According to the National Medicinal Plant Board of India, the *M. spinosa* has intermediate threat status. Thus a proper conservation and sustainable harvesting methods are required. Medicinal value of *M. spinosa* is restricted in certain ethnic/rural communities and is little known to outer world. The plant is not documented in different Indian codified system of medicine including Ayurvedic system. It is also important to identify the *M. spinosa* and *M. laxiflora* properly based on the current classification before scientific investigation, which will help to document, explore individual plants and to converse the plants. Few scientific research and phytochemical studies conducted on the *M. spinosa* clearly showed that the plant has high value in curing diverse ailments. Therefore, documentation of folk uses and peruse modern scientific research based on traditional knowledge will be helpful to bring this plant or phytoconstituent into an existing framework of rational use of medicine in modern era, which can make the difference to treat the diseases.

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