



Mini Review Article

Traditional Uses, Phytochemistry and Pharmacology of *Mimusops hexandra* Roxb

Neha Mishra, Arvind Pareek

School of Science and Technology, Vardhaman Mahaveer Open University, Kota, Rajasthan, India

*Corresponding author: arvindvmou@gmail.com

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ABSTRACT

Mimusops hexandra (Roxb.) is an evergreen tree species with a long history of traditional medicinal uses in south Asia especially in western and central India, belongs to family Sapotaceae. The plant has been known for its curative properties and has been utilized for treatment of various diseases such as ulcer, bronchitis, jaundice, ulitis, fever, hyper dyspepsia, arthritis and alimentary disorders. A survey of the literature shows extracts and metabolites from this plant possess pharmacological properties such as anti-inflammatory, antiulcer, aphrodisiac, alexipharmic, anthelmintic, antibacterial, and free radical scavenging activity. Beside medicinal uses, plant has high economic value due to its edible and nutritive fruit, useful wood, latex and bark and provides substantial livelihood support to local inhabitants. A wide range of chemical compounds including sterols, starch, terpenoids, anthraquinone glycoside, cardiac glycoside, saponin and tannins etc. have been isolated from this species. The presented review summarizes the information concerning the traditional uses, phytochemistry and biological activity of *Mimusops hexandra*.

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Mimusops hexandra (Roxb.) [Synonym: *Manilkara hexandra* (Roxb.) Dubard] is ethno medicinally important species of tropical deciduous forests of western and central India. It belongs to family Sapotaceae and it is native of South Asian region (Balfour, 1873; Vincken et al., 2007). *M. hexandra* grows in natural wild conditions and mainly propagated through seeds. Its usage has been reported mostly in traditional medicinal system of India. Traditionally it is used in medicinal herbal drugs to cure various diseases such as jaundice, ulitis, odontopathy, fever, colic dyspepsia, helminthiasis, hyper dyspepsia and burning sensation (Joshi, 2000). It purifies the blood and beneficial in swelling, abdominal colic, gout, rheumatism and toxicosis (Rao, 1985). It contains a variety of components which possess various biological activities such as anti-inflammatory, diuretic, antiurolithiatic, analgesic, antipyretic and antimicrobial activity (Khare, 2007).

M. hexandra is commonly known as Obtuse Leaved *Mimusops* in English; Khirni and Rayan in Hindi; Rajadanah in Sanskrit; Ulakkaippalai and Palai in Tamil; Patla, Pola and Kirni in Telgu; Krini and Palamunpala in Malayalam and Hale and Hannu in Kannada (Warrier, 1995). It is evergreen tree, 50–60 ft. tall, with blackish gray and deeply furrowed bark; leaves are 7–10 cm long, elliptic or oblong, flowers are bisexual, white, calyx 6-lobed, corolla 16 or 24-lobed, stamens 6, ovary is hairy and multi-locular with axile placentation, fruit is berry, one seeded shining yellow with ovoid shape and seeds are endospermic and oily (Dwivedi and Bajpai, 1974). *M. hexandra* yield edible fruit, useful wood and latex which are significant source of

nutritional and livelihood support for tribal population (Peter, 1999). The bark of this plant species is astringent, refrigerant, febrifuge, sweet, tonic and is used traditionally to treat a wide range of gastrointestinal disorders (Shah et al., 2004). Seed oil of *M. hexandra* is demulcent and emollient (Anjaria, 1997). The purpose of the present review is highlighting the various traditional uses, phytochemistry and pharmacological reports on *Mimusops hexandra*.

Ethnopharmacological studies show that *M. hexandra* is used in many parts of India for the treatment of number of diseases (Table 1). Mostly western and central part of India (Andhra Pradesh, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu) has a long history of traditional medicinal use of *M. hexandra*. Some of these uses are outlined here.

A survey from Jalgaon district of North Maharashtra shows that its fruits are used to relieve digestive disorder (Patil and Patil, 2012). Mashed fruits of *M. hexandra* are taken to cure diseases like arthritis and jaundice, also used for heat burning, wormicide, and to purify blood by local population of Nawargaon village (Bakare, 2014) and Bhadravati tehsil of Chandrapur District, Maharashtra (Harney, 2013). Tribal people of Rayalaseema region of Andhra Pradesh use *M. hexandra* leaf extract for treatment of asthma (Anjaneyulu and Sudarsanam, 2013). The Iruilas medicinal utility of the flora in the Kodiakarai Reserve Forest (KRF) shows that the latex of *M. hexandra* is applied on teeth and gums for toothaches (Ragupathy and Newmaster, 2009). According to Paderu division of Eastern Ghats of Andhra Pradesh root

Table 1: Ethno medical uses of *Mimusops hexandra* in India

Place, Country	Parts used	Ethno medical use	Preparation (s)	Reference (s)
Maharashtra	Fruit	Arthritis, Blood purifier, Heat Burning, Jaundice	Mashed	Bakare , 2014
West Bengal	Bark, Fruits	Jaundice, Bilioussness	Decoction	Sharma et al. 2014
Andra Pradesh	Leaves	Asthma	Decoction or Infusion	Anjaneyulu and Sudarsanam, 2013
Andra Pradesh	Stem Bark	Galactagauge	Infusion	Padal et al., 2013
Maharashtra	Fruit	Digestive disorder	Mashed	Patil and Patil, 2012
Tamilnadu	Stem Bark, Leaves	Infertility, Veterinary	Infusion	Gunasekaran and Balasubramanian, 2012
Rajasthan	Stem Bark, Fruit	Fever, jaundice,	Decoction, Mashed	Malik et al., 2012
Madhya Pradesh	Stem Bark, Fruit	Bronchitis, Dysentery	Decoction, Mashed	Malik et al., 2012
Maharashtra and Gujarat	Stem Bark, Fruit	Alimentary Disorders	Decoction, Mashed	Malik et al., 2012
Tamilnadu	Stem Bark, Fruit	Fever, Hallucination	Decoction, Mashed	Vinothkumar et al., 2011
Andra Pradesh	Root	Headache	Infusion or Decoction	Rao et al., 2010
Kodiakarai	Latex	Toothache	Applied Directly	Ragupathy and Newmaster, 2009
Andra Pradesh	Stem Bark	Dysentery and Diarrhea	Decoction	Raju and Reddy, 2005
Madhya Pradesh	Stem Bark	Tonic	Decoction or Infusion	Rai , 1987
Madhya Pradesh	Stem Bark	Bodyache	Boiled	Maheshwary et al., 1985

Table 2: Ethno botanical uses of *Mimusops hexandra*

Place, Country	Plant Part	Ethno botanical use	Reference(s)
Madhya Pradesh, India	Bark	used to produce natural dyes nutritive, sold in markets	2014 Upadhyay and Choudhary, 2014
Rajasthan, India	Bark	used for tanning	Malik et al, 2012
Tamil Nadu, India	Leaves	used for oil presses,	Muruganandam et al., 2012
Madhya Pradesh , India	Wood	house building and turnery	Malik et al., 2012
Central and Western India	Fruits	used as fodder for cattle	Pareek et al. ,1998

Table 3: Phytoconstituents of *Mimusops hexandra*

Phytoconstituent (s)	Source	Reference (s)
Triterpenoidsaponin, β -sitosterol	Stem bark	1994 Gopalkrishnan et al., 2014
Sterols, Volatile oil and Tannin	Leaves	Madhak et al. 2013
Saponin 1, 2 and 3, Gallic acid, Myrecetin, and Quercetin	Seeds	Eskander et al., 2013
Proteins, Lipids and Carbohydrates	Fruits	Daripkar and Jadhav, 2010
Unsaponifiable lipids, Alcohols, Hydrocarbons, Triterpene and Sterols	Seeds	Saeed et al., 1991
Triterpene alcohols	Fruits	Misra et al., 1974
Cinnamic acid, Hentriacontane Taraxerol and Quercitol	Leaves	Misra and Mitra, 1968
α - and β - Amyrins, Taraxerol α -spinasterol	Roots	Misra and Mitra, 1968

extract of *M. hexandra* is beneficial for relief from headache (Rao et al., 2010). The folk use of *M. hexandra* has been documented in Konda Reddy, Koyas tribes in Khammam district of Andra Pradesh, a decoction of the stem bark is used to cure dysentery and diarrhea (Raju and Reddy, 2005). The stem bark boiled with water is used for bathing to cure body ache by bhil tribe of Jhabua district, Madhya Pradesh (Maheshwary et al., 1985). Extract of stem bark is taken as tonic by Bharia and Gond Tribes of Tamiya and Petalkot of Madhya Pradesh (Rai, 1987).The stem barks infusion of *M. hexandra* is widely used in Konda Dora Tribes in Vishakhapatnam district of Andra Pradesh as galactagauge (Padal et al., 2013). A decoction of bark and mashed fruits are used in sacred groves in Pudukottai

district Tamil Nadu for fever and hallucinations (Vinothkumar et al., 2011).

Several phytochemicals have been isolated and identified from different parts of *M. hexandra*. Summary of the related literature have been discussed in Table 3.

Madhak et al., (2013) observed the presence of sterols and volatile oil in leaves of *M. hexandra* by phytochemical analysis and appropriate chemical tests of aqueous and alcoholic extracts of leaves and lead acetate test of leaf extracts also shows the presence of tannin. Misraand Mitra (1968) isolated cinnamic acid, hentriacontane, taraxerol and quercitol from leaves of *M. hexandra*.

Daripkar and Jadhav (2010) evaluated the proteins, lipids, carbohydrates and moisture content of fresh fruits of *M. hexandra* through chemical analysis which is about 3.53%, 2.6%, 22% and 71.87% respectively. A study carried out by Misra et al., (1974) show the presence of the fatty acid esters of common triterpene alcohols from fruit pulps of *M. hexandra*.

Three bidesmosidic saponins namely saponin 1, 2 and 3 possessing protobassic acid and 16- α -hydroxyprotobassic acid as aglycons and also three phenolic compounds such as gallic acid, myrecetin, and quercetin were isolated by Eskander et al., (2013) through chromatographic separation of acetone precipitate of seeds of *M. hexandra*. Saeed et al., (1991) isolated the unsaponifiable lipid constituents. Saponins and tannins in bark of *M. hexandra* through physicochemical, histochemical analysis and Thin Layer Chromatography (TLC) of alcoholic, chloroform and water extracts of *M. hexandra* bark. A triterpenoid saponin, 1 β 2 α , 3 β , 19 α -tetrahydroyursolic acid 28-O- β -D-glucopyranoside and β -sitosterol have been isolated from the stem bark of *M. hexandra* by Shrivastav and Singh (1994).

Misra and Mitra (1968) have been isolated the cinnamic acid ester of α - and β -amyrins, taraxerol, α -spinasterol and quercitol from the roots of *M. hexandra*.

Gopalkrishnan et al., (2014) found the presence of starch, terpenoids, proteins, anthraquinone glycoside, cardiac glycoside, saponins and tannins in bark of *M. hexandra* through physicochemical, histochemical analysis and Thin Layer Chromatography (TLC) of alcoholic, chloroform and water extracts of *M. hexandra* bark. A triterpenoid saponin, 1 β 2 α , 3 β , 19 α -tetrahydroyursolic acid 28-O- β -D-glucopyranoside and β -sitosterol have been isolated from the stem bark of *M. hexandra* by Shrivastav and Singh (1994)

Several pharmacological activities and medicinal applications of *M. hexandra* are widely known. Whole plant parts have been used for various medicinal purposes. A summary of the biological studies on *M. hexandra* is presented below.

Antiulcer effects of acetone extract and its different fractions namely diethyl ether, ethyl acetate and aqueous fractions of stem bark of *M. hexandra* have been tested by Modi et al., (2012) and Shah et al., (2004) for the presence of preliminary phytoconstituents and were screened for their antiulcer potential against experimental gastro-duodenal ulcers. The antiulcer activity was shown by ethyl acetate extract as it decreases gastric acid secretory activity along with strengthening of mucosal defensive mechanisms.

Gomathi (2012) indicated that polysaccharides extracted from *M. hexandra* bark significantly stimulate the immune system by stimulating macrophage function. Eskander et al. (2013) suggested that acetone fraction of *M. hexandra* containing the crude saponin mixture possessed significant anti-inflammatory activity.

Nimbekar et al., (2013) observed that methanolic extract of *M. hexandra* reduces the blood glucose level and shows significant hypoglycemic effect. Their study indicates that it can be used in the management or control of type II diabetes.

A study conducted by Kumar et al., (2010) shows that methanol leaf extracts of *M. hexandra* showed strong 2, 2-diphenyl picrylhydrazyl (DPPH) radical scavenging activity.

Antibacterial activity of aqueous, petroleum and alcoholic extracts of *M. hexandra* was tested by Parekh and Chanda (2007; 2010) using the agar disc diffusion and agar well diffusion methods and found that ethanol or methanol extracts are active against six bacterial strains belonging to *Enterobacteriaceae* and various infectious diseases. The antimicrobial activities of root extracts of *M. hexandra* prepared in different solvents were screened by Bharwad et al., (2011) through agar well diffusion method, zone of inhibition was measured as a property of antimicrobial activity and it was observed that methanol root extracts of *M. hexandra* exhibited good antibacterial activity against *Staphylococcus aureus*, *Micrococcus leutius*, *Salmonella paratyphi*, *Serratia marcescens* and *Klebsiella pneumonia*. Mahida et al., (2007) also indicates that extract of *M. hexandra* shows antibacterial activity against multi drug resistant bacteria species i.e. *Salmonella typhi*, *S. paratyphi*, *Staphylococcus aureus* and *S. epidermis* which are associated with skin, respiratory diseases and enteric fever.

CONCLUSION

Mimusops hexandra is a well-known medicinal and commercial important tree species and widely used as herbal drug and as a source of livelihood support by local tribal population.

The phytochemical studies conducted on *M. hexandra* indicate presence of various phytoconstituents such as sterols, tannin, saponins, unsaponifiable lipids, triterpene alcohols, terpenoids and phenolic compounds such as gallic acid, myrecetin, and quercetin etc. in different parts of the plant. Plant extracts of *M. hexandra* exhibit diverse categories of pharmacological activities such as anti-inflammatory, antiulcer, antidiabetic, antibacterial and free radical scavenging activity etc.

However, only a small proportion has been investigated both phytochemically and pharmacologically. It is important to investigate the gaps in the studies, which may be further bridged in order to exploit the full medicinal potential of *M. hexandra*, as this plant has widespread use also with extraordinary medicinal potential which should be better explored to find new biological properties which may increase its importance as efficient medicinal plant in biodiversity.

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