

Mesua ferrae linn:- A Review of the Indian Medical Herb

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ABSTRACT

Plant kingdom provides us abundance of plant with various medicinal properties. Which can be used as Remedial agents for various health issues. *Mesua ferrae Linn.* (*Clusiaceae*) is a rare plant which is being used for its properties and effects like anti-septic, anti-inflammatory, blood purifier, expectorant, purgative, antiasthmatic etc. *Mesua ferrae Linn.* (*Nagakesara*), cobra's saffron, is named after the heaviness of its timber and is mostly cultivated in tropical climates, consists foliage and fragrant flowers. It is highly used in the ayurveda for the treatment of pain, inflammation and rheumatic conditions. It is observed and proved that the presence of Phenylcoumarins, Xanthenes, Triterpenoids, Fats and Flavanoids are presence in this plant which is responsible for its biological as well as medicinal properties. It is also known to be called Sri lankan ironwood, India rose chestnut. The tree can grow over 30 meters tall. *Mesua Ferrae* is cultivated

as an ornamental plant due to its graceful shape, Pink to Red drooping leaves and large beautiful, fragrant white flowers. The present review summarizes various important, essential and medicinal properties of this Indian medicinal herb.

Key words: *Mesua Ferrae Linn*, *Ornamental*, *Ayurveda*, *Rheumatic*, *Medicinal Value*.

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DOI : 10.5530/srp.2017.1.5

INTRODUCTION

Mesua Ferrae Linn. belongs to family *Clusiaceae*. In hindi it is commonly known as Nagakesara and its English name is Ceylon iron wood. It may be medium or a large ever green tree with a small short trunk, found abundantly in the Himalayas from Nepal eastward, in north India, Deccan peninsula and the Andaman islands, to an altitude of 1.500m. Trees are cultivated for its flowers as they are highly attractive and ornamental in nature. Its flowers as well as its leaves have high and rich medicinal value and property and act as an antidote for dangerous snake bite. One of its biggest and vital applications is found on its flowers, as a paste of its flowers with mixture of butter and sugar is highly useful in treating and curing bleeding piles and burning of feet. Its seed oil can be beneficial in the curating of itch.¹ Nagakeshara is one of the cathurjata.² The plant is frequently used as antimicrobial,³⁻⁶ antibacterial and antiprotozoal. This plant *Mesua Ferrae Linn* is cytotoxic to T-lymphocyte leukemia cells and antimicrobial.⁷ also possesses anti-inflammatory and anti-ulcers along with central nervous system (CNS) depressant.⁸ Plant known to consist glycosides, Flavanoids, xanthenes, Triglycerides and resins. Important oils, Fatty acids some steroids, reducing sugar, tannin, saponin and some proteins are to be presented in this plant. The flowers of this plant frequently contains α -copaene and germacrene D.⁹ Linn plant is also used as adulterants.¹⁰ Leaves has been used in the form of poultice which can be applied to head in severe colds, also can be used in any kind of disturbance of stomach, cough, high perspiration, dyspepsia etc.¹¹ Leaves are also used in treating scorpion stings. In Ayurveda, it is an essential and chief ingredient of Nagakeshara-adi-churna, used in curing bacillary dysentery and Naga-keshara yaga, in case of piles. In unani medicines it acts as an important ingredient of Jawarish Shehryaran, a liver tonic, Hab Pachuluna an appetizer. It act as an anti convulsant also, Seizures can be cured by this plant.¹²

Classification

Kingdom - Plantae

Order - Malpighiales

Family - *Clusiaceae/Calophyllaceae*

Genus - *Mesua*

Species - *Ferreia/ M.ferreia*

Full Name - *Mesua Ferrae Linn*¹³

Distribution

Mesua Ferrae Linn is widely and frequently distributed in the dense mountains of Eastern Himalayas, Bengal, Assam, Tenasserim burma, Andamans, evergreen rainforests of northern kanara and southern part of konkan, huge forests from western ghats to southern kanara to travancere.¹⁴

Morphology of mesua ferrae linn.

It is known to be evergreen tree 20-30 m in height, often fluted at base, creamy white or pinkish brown, heart wood dark red, very hard, bitter sometimes sweet scouted, bark surface is smooth. Leaves opposite, simple and entire, flowers are showy, white yellow or red, polygamo to dioecious, sepals are 2-6, imbricate or decussate, petals are 2-6 imbricated. Fruit is ovoid-globose having conical point, striate, 1-10 loculed, 1-4 seeded. Flowers are bisexual with numerous golden colour stamens. Leaves are somewhat shiny, due to numerous secondary veins running to the margin. Useful parts all fruits, seed, flowers, Buds, Leaves and Bark. Mostly used part is stamens.¹⁵ **Figure¹⁶ *Mesua Ferrae Linn.*** (i) Tree; (ii) Fruit; (iii) Leaves; (iv) Flower and; (v) Seeds. It flower in the dry season and give out new leaves just after flowering during the rainy seasons. Bisexual flowers only open for one day between 3-4am and get closed around sunset.¹⁷

Medicinal uses

The plant have high medicinal value and used in inflammation as well as septic condition.¹⁸ It is used for its antiseptic, purgative, blood purifier, worm control, tonic properties etc by the tribal people of Assam.¹⁹ It is also used to cure fever, cold, asthma and can be useful as cardiotoxic, expectorant, carminative, and antipyretic agent.²⁰ Sore Eye can be treated with the ashes of leaves of the plant. Kernels can be used in skin eruption problems.²¹ Leaves as well as flowers are used against snake and scorpion sting. Oil is used for skin infection, scabies, wounds and rheumatism. There flower are highly expectorant, stomachic and astringent. Bark as well as root act as bitter tonic for the treatment of gastritis, bronchitis.²²

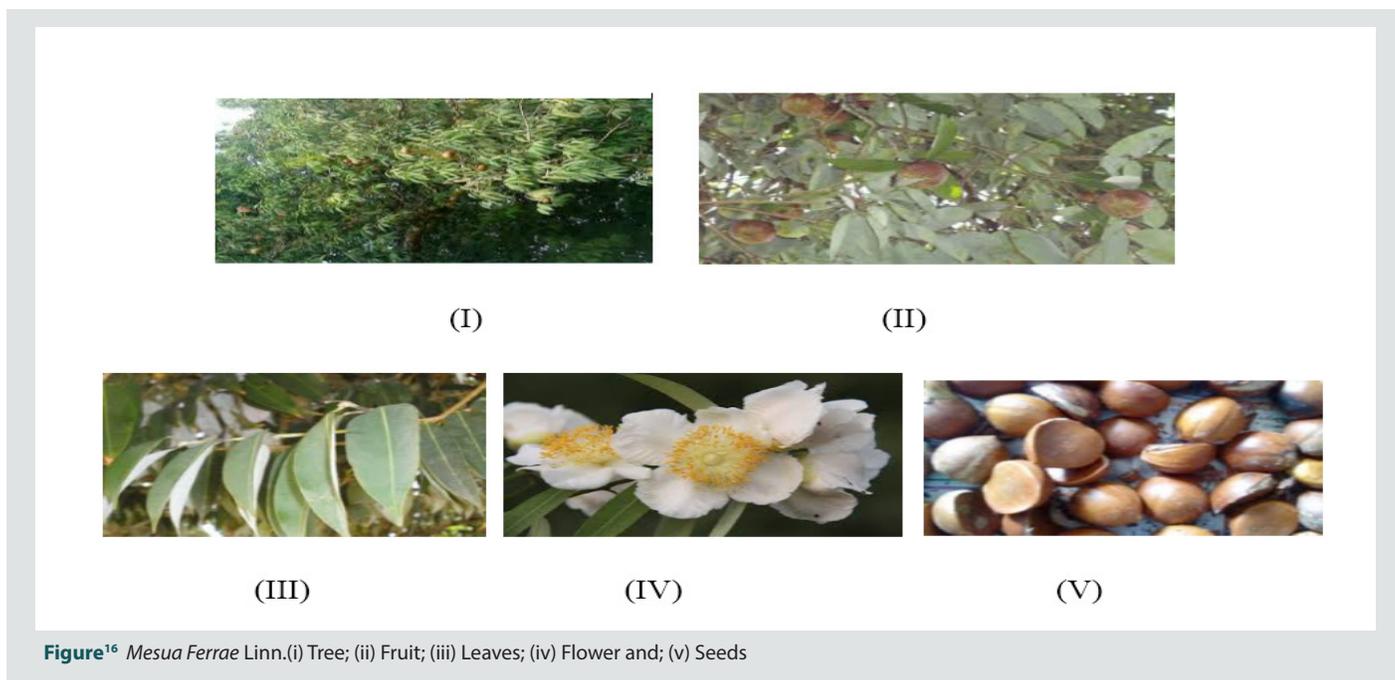


Figure 16 *Mesua Ferrae* Linn.(i) Tree; (ii) Fruit; (iii) Leaves; (iv) Flower and; (v) Seeds

Antioxidant and hepato-protective activity

Methanolic extract from dried flowers are used female wistar mice have been used in experiment for antioxidant and hepato-protective activity. Drinking water is used for the performing of the artificial infection of *S. aureus*. After this sampling was done once in a day and after one week. There was increase in liver SOD (Super oxide dismutase) and AST (Alanine aminotransferase) in treated groups and reduction in seen in catalase, Glutathione reductase and glutathione peroxidase activity.²³ Flower ethanolic extract showed inhibitory activity against nitric oxide assay.²⁴ Its leaf extract showed inhibition to lipid peroxidation.²⁵

Analgesic activity

Extracts of *M. ferrae* leaves like n-Hexane, ethyl acetate and methanol. Showed significant analgesic activity to acetic acid writhing response in mouse. Lower dose response is 10-21% and higher dose response is 17.06%.²⁶

Anti Spasmodic activity

M. ferrae extract like petroleum of seed. Oil possesses anti spasmodic activity. *In vitro* on isolated rat ileum acetylcholine and carbachol caused contraction up to 2.61-3.20cm. Response of acetylcholine in presence of atropine was measured to be reduced to 55%.²⁷

Anti Venom activity

When treated with scorpion venom aqueous extract of *M. ferrae* leaves was seemed to have anti venom property as its show activity against fibroblast cell lysis.²⁸

Cancer Chemotherapy *M. ferrae* was observed for its significant role in reduction of chemotherapy toxicity in women with breast cancer. There is significant reduce in toxic level in chemotherapy cycles. It is evaluated in maharisi amrit kalash-4 (MAK-4) containing *M. ferrae*.²⁹

Immunomodulatory activity

M. ferrae flower buds contain a poly herbal, ACII was studied for immune modulation effect on radiation induced immune suppression it is observed high increase in circulating. Antibody specially in animals

treated with ACC II further there is no change in the weight of body. WBC count increases. Whereas no change in hemoglobin was seen in normal or drug treated animals. There is also no change in lymphocyte-neutrophil ratio. Bone marrow get improved along with this improvement is seen in α -esterase cells too, thymus weight increases.³⁰ Although ACII effect is seen in normal³¹ and cyclophosphamide treated animals.³² By using various specific and non specific immune response in animals for seeing Immuno modulatory activity of *M.ferrae* seed oil was studied by isolating mesuol from *M.ferrae* seed. It is observed that in humoral response model. Mesuol cause increase in dose dependent in antibody (9th and 6th day) as well as induced. Immuno suppression which is seen in sheep RBC (7th and 14th day) of experiment. Where as in cellular immune response model, an increase in Paw volume was observed 23rd day in rat treated with SRBC (Sheep RBC). Further mesuol help in restoring hematological property in cyclophosphamide induced myelosuppression model. So after discussing all this the report indicate clearly the modulatory activity of mesuol.³³

Anti-neoplastic activity

In vitro cell lines crude ethanolic extract *M. ferrae* was observed to be prove good against human cholangio carcinoma (CL-6) human laryngeal (HEP-2) and human hepatocarcinoma (HepG2). The extract showed excellent property against CL-6 with survival of less than 50%.³⁴ Its Methanolic extract was used against Ehrlich ascites carcinoma mice also seen tumor growth inhibition.³⁵

Effect on CNS System

Xanthenes which were isolated from *M. ferrae* were evaluated for its effect on behavior in mice. Gross behavior changes were seen at 15, 30, 60 and 120 min with a dose of 10, 25, 50, 100 and 500mg/kg. *M. ferrae* shows various sign and symptom of CNS depression with significant activities like sedation, decrease motor activity as well as muscle tone. It effect was at peak at the dose of 200 mg/kg.

Anti-inflammatory activity

Using albino rats Mesuaxanthone A and Mesuaxanthone B (MXA and MXB) from *M. Ferrae* were observed by carrageenan induced hind Paw

oedema and granuloma pouch tests. MXA shows 37% MAB showed 49% reduction when compound with normal group. But it is known than xanthenes show significant anti-inflammatory property in normal and adrenalectomised rats. So xanthenes used here for its important inflammatory activity.³⁶

Anti ulcer activity

Xanthenes also possesses antiulcer activity in albino rats by pyloric ligation method. Treated animals showed high ulceration, hemorrhage and perforation while pretreated animals showed scattered hyperemia and occasional hemorrhage.³⁶

Antimicrobial activity

Due to the presence essential oil xanthenes and coumarines present in the seed of the *M. ferrae*. This indicates that this extract could be useful in fighting and preventing emerging drug-resistance microorganism. Further the lipophilic extracted of *M. ferrae* Linn showed more activity towards gram positive bacteria.³⁷ Methanol as well as dichloromethane extracts of plant *M. ferrae* flowers have a property of inhibition against all the tested bacteria by using dilution-streak method against micrococcus luteus, E. coil, Candida albicans and Aspergillus Niger etc.³⁸ But *M.ferrae* extract are not so much significant are tested fungal strain.³⁹

Anti arthritic activity

M. ferrae has a huge potential and protective effect against the formaldehyde as well as adjuvant-induces arthritis in rats. This effect and activity was shown by *M. ferrae* seed extract i.e. petroleum ether, ethyl acetate and alcohol. Body weight change, increase RBC's count, Decrease RBC's count, decrease (Hb) count and increase erythrocyte sedimentation rate was induced by *M. ferrae* treatment.⁴⁰

Therapeutic uses

Sore throat, Cough and asthma can be treated with the help of extract. Like ethanol and petroleum ether of plant *M. ferrae*⁴¹⁻⁴³ its flower buds. Are also used in curing disease. Like dysentery in sever colds leaves are useful in the form of poultice.⁴⁴⁻⁴⁶

Phytoconstituents

It is believed to be that *M. ferrae* is only species which is chemically studied from the genus of mesua.⁴⁷ The genus is rich in secondary metabolites such as Phenylcoumarins, xanthenes and triterpenoides.⁴⁸⁻⁵⁰ A oil which is commonly called nahor can be extracted from the seed of the plant.^{44,45} It was also reported that form the seeds of *M.ferrae* 4-Phenylcoumarins such as mesuol, mesuagin, mammeisin and mesuone were isolated. Stamens can given α and β - sitosterol, biflavonoids mesuaferrones A & B euxanthone 7-methyl ether and other essential constituents. Xanthone derivative are also been possessed by various parts of the plant.^{43,48} It is reported that two extremely new yellow pigments i.e. meauxanthone A & meauxanthone B have been identified. In the heart wood extracts of plant *M.ferrae*.⁵¹ Stamens consists the drug namely Nagakeshara is composed of mesuferrone A & B, mesuaferrol, mesuanic acid, α & β amyryn.⁵¹ It is also evaluated that the alcoholic extracts as well as H₂O extracts of *M.ferrae* were highly rich. In reducing sugars, tannins and saponins.⁵²

Poison

Sometimes, the flowers extracts of plant *M. ferrae* result in lack of implantation in rats and also prevent pregnancy.⁵³

Various products of *M. ferrae*

Fuel: - *M. ferrae* can be used as firewood as well

Dye staff:-The flowers of the plants can be used in dyeing for the fixed colours which are one of the essential products of *M. ferrae*.⁵⁴ The fragrant and beautiful flowers are well used to fill pillows, cushion and also

used in cosmetic products for beautification. *M. ferrae* also help nitrogen fixing. Process as it is reported that endomycorrhizal associations in *M. ferrae* moreover in India the tree possesses a high sacred value and consider as scared. The seed oil of *M. ferrae* is used in curing dandruff also.

Tree and germplasm management

Their seedlings can be planted in the field after one are two years as it is known the tree growth is very slow and is not much known for plantation. It must be transported via road as its log is highly sinkable in water. Seeds of *M. ferrae* are easy to handle and its germination is good and rapid in nursery. Rate of germination is 30-70% as germination is hypogeal as a seeds fastly loses their viability between a period of 2-3 months. So management and storage is done using perforated polythene bags at 5°C protection from sunlight and moisture. It can be attacked by termite and fungus well known as ganoderma lucidum causes root and but rot disease in plant as the larva of the fungus feed on the sap of the leaves of the plant.

Soil which is suitable for the best growth of *M. ferrae* is fairly rich and well drained soil.¹⁷

CONCLUSION

M. ferrae is being used in India and various other parts of world and this plant has its special place in Ayurveda as the drug is useful for multisystem disorders and this drug proved to be most used and consumed drug by domestic industries. The plant is known for its antioxidant, analgesic, anti-inflammatory, anti-tumor, antimicrobial and several other activities and properties. It acts as ingredient for Ayurvedic as well as unani medicines. The seed oil is helpful in various skin diseases and is a useful analgesic. Nagakesara can be used over penis in case of impotently due to its stimulant action. The unripe fruits are aromatic and sudorific in nature. This plant can be used in cosmetic products. Overall *M. ferrae* exhibits various uses and important application which can act as gift for curing various disease and disorder. Further studies on this plant must be carried out to explore some other important, necessary and unknown benefits or *Nagakesara*.

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GRAPHICAL ABSTRACT



Different parts of *Mesua ferrae* linn
(Fruit, Leaves, Flower and, Seeds)

Qualitative Phytochemical Analysis

- ✓ Alkaloids
- ✓ Flavonoids
- ✓ Tannins
- ✓ Saponins
- ✓ Steroids
- ✓ Cardiac Glycosides

Note: (+) Means Positive, (-) Means negative

PHYTOCHEMICAL	Fruit	Leaves	Flower	Seeds
Alkaloids	-	-	-	-
Flavonoids	+	+	+	+
Tannins	-	-	-	-
Saponins	+	+	+	+
Steroids	-	-	-	-
Glycosides	+	+	+	+
Xanthones	-	+	+	+
Terpenoids	-	-	-	-
Triglycerides	+	+	+	+
Resins	+	+	+	+
Coumarins	+	+	+	+

SUMMARY

- *Mesua Ferrae* Linn belongs to the family Clusiaceae and commonly known as Nagakesara. This plant mostly found in moist or semi- evergreen forest, need fertile soil. The leaves of the plant are elliptical in shape, lanceolate, generally cover over with a waxy bloom, a red in colour when young, opposite and simple with an entire margin. The upper surface is glabrous where as lower surface is glaucous. Texture of the leaves is shiny with various veins running near by margin. Base of the leaf is rounded or may be in acute shape. Evergreen tree with 20-30m in height and possesses high medicinal value and it act as antiseptic, blood purified, so it can be treated with leaves ashes, anti-neoplastic anti-venom, anti-spasmodic activity, analgesic activity. So to make logn story short this plant each and every part is highly useful and act as boon to mankind.

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