

PHARMACOGNOSTIC, PHYTOCHEMICAL AND PHARMACOLOGICAL REVIEW ON
MACHILUS MACRANTHA NEES.

Anilkumar U. Tatiya*, Vishal G. Beldar and Sanjay J. Surana

Department of Pharmacognosy, R. C. Patel Institute of Pharmaceutical Education and Research, Shirpur, 425405, Dhule, Maharashtra, India.

*Corresponding Author: Dr. Anilkumar U. Tatiya

Department of Pharmacognosy, R. C. Patel Institute of Pharmaceutical Education and Research, Shirpur, 425405, Dhule, Maharashtra, India.

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ABSTRACT

Machilus macrantha Nees. (Lauraceae) is commonly known as “Gulmaau, Golum, Pisara, Kurma” is an evergreen tree, extensively spread to Deccan and Peninsular region of India and Sri Lanka. Conventionally, the plant is being used as anti-asthmatic, anti-rheumatic, anti-tuberculosis, anti-ulcer, consumption as well as various folklore uses such as in treatment of bone fracture, weakness and debility. In recent times, the plant has been investigated various pharmacological activities like anti-inflammatory, antioxidant, CNS depressant, hypotensive effects, etc by using *In-vivo* & *In-vitro* models. The present review is therefore, an attempt to provide a comprehensive study on its pharmacognostical, phytochemical, pharmacological properties and ethno-medicinal uses of *Machilus macrantha*.

KEYWORD: *Machilus macrantha*, Pharmacognostical, Phytochemical, Pharmacological, Ethno medicinal, Machiline.

INTRODUCTION

The history of herbal medicine is as old as human culture. From the thousands of years plants have been utilized as medicines. At the start these medicines took in the form of crude drugs for instance tinctures, teas, poultices, powders, and other herbal formulations. Through oral history, the methods of use of specific plant for particular ailments were passed down. India has an ancient heritage of traditional system of medicine which includes Ayurveda, Siddha, Unani and Homoeopathy system of medicine. Extraction, isolation and its characterization of pharmacologically active compounds from medicinal plants persist today. More recently, drug discovery techniques have been useful to the standardization of herbal medicines, to elucidate analytical marker compounds.^[1-2]

The genus *Machilus*, variable evergreen trees or shrubs, widely distributed in South-East Asia, comprises 100 species of Lauraceae family. Species of the genus *Machilus* (Lauraceae) are sources of secondary metabolites with interesting chemical structures and important bioactivities, which include 18 species distributed throughout India. Some of those important species are as follows: *Machilus bombycina*, *Machilus dubia*, *Machilus duthiei*, *Machilus edulis*, *Machilus gambie*, *Machilus gammieana*, *Machilus glabosa*, *Machilus odoratissima*, *Machilus parviflora*, *Machilus villosa*.^[3-6]

This article will improve the existing knowledge of *Machilus macrantha* and also produce consciousness of the potential therapeutic uses for the expansion of new leading molecule for greater health care in the near future. The present review is therefore, an attempt to provide a comprehensive study on its pharmacognostical, phytochemical, pharmacological properties and ethno-medicinal uses.

MORPHOLOGY

Persea macrantha (Nees) Kosterm syn. *Machilus macrantha* Nees, *Machilus glaucescens* Wight (Family-Lauraceae) is up to 27 m tall tree and 3 m in girth with cylindrical bole up to 7.5 m long (Fig 1). It is found in Western Peninsula, Sri Lanka and in India up to an altitude of 2100 m.^[3-6]

Fig 1: *Machilus macrantha* Tree

TAXONOMY

Kingdom	: Plantae
Subkingdom	: Viridaplantae
Phylum	: Tracheophyta
Subphylum	: Spermatophytina
Infraphylum	: Angiospermae
Class	: Magnoliopsida
Subclass	: Magnoliidae
Superorder	: Lauranae
Order	: Laurales
Suborder	: Laurineae
Family	: Lauraceae
Genus	: Persea
Subgenus	: Machilus
Species	: <i>Machilus macrantha</i> Nees

COMMON NAMES^[4]

English	: Machilus
Marathi	: Golum, Pisara, Kurma
Kannada	: Gulmavu, Chittutandrimara
Tamil	: Kollamavu, Anaikkuru
Malayalam	: Uravu

TRADITIONAL / ETHNOMEDICINAL USES

The tree has many folk uses in various states of India; the bark is used in consumption, asthma and rheumatism while the leaves are used externally in ulcer.^[3-5] Bark of the plant was documented for the treatment of bone fracture.^[7-8] To treat asthma and rheumatism, the decoction of powdered bark is taken^[9] for the treatment of weakness and debility, the crushed bark of plant given with milk.^[10]

OTHER USE

Commercially, bark is also used in the preparation of incense-stick, match boxes and ornamental things etc. Carving, furniture, light construction, joinery, veneer and plywood, musical instruments.

CHEMICAL CONSTITUENTS

Alkaloids, lignans, tannins, steroids, triterpenoid, mucilage etc.^[11-12]

PHARMACOGNOSTIC STUDY

Root: The detail Pharmacognostic study of root was carried by Gaiind et.al. Externally, roots are found cylindrical in shape, yellowish brown to buff in colour and odour is aromatic. Externally roots are having longitudinal wrinkles and rootlet scars. Internally, the roots is characterized by a wide zone of cork cells, phelloderm (up to 7-8 layers) composed of lignified stone cells with wide lumen and filled with dark reddish-brown matter, presence of starch grains, mucilaginous matter and few yellow oil cells in cortex phloem and xylem parenchyma, three to five layered pericycle consisting of stone cells with narrow lumen and devoid of cell contents, isolated groups of stone cells in the phloem and the presence of lignified phloem and xylem fibers with narrow and large lumen respectively.^[13]

Stem Bark: The details of Pharmacognosy of the stem bark have carried out by Kulkarni et al. The important morphological features are presence of wrinkles, fibrous fracture and characteristic odour. Anatomical characteristic includes periderm, followed by cortex, band of stone cells and secondary phloem. Periderm is composed of cork, phellogen and phelloderm. The continuous bands of lignified sclereids, consisting of scattered bundles of refractory pericyclic fibres are important identifying characters of the bark. Secondary phloem region is composed of phloem parenchyma, phloem fibers and medullary rays.^[11]

Leaves: The details of pharmacognosy of the leaves have carried out by Surana et al & Renjumol et al. The important morphological features shown by the leaf are entire margin, asymmetrical bases, reticulate venation, glandular and non-glandular hairy trichomes. Petioles are medium sized or as long as the lamina, 10-20 cm long, thick, fistular, glandular and often yellowish green or purple in color. Transverse section of leaf passing through midrib and lamina shows: 5-6 layers of thick walled collenchymatous cells below the upper epidermis, Distinct phloem tissue can be seen on the ventral surface and well developed xylem tissue towards the dorsal surface of the midrib, Xylem shows presence of tracheids, xylem parenchyma, protoxylem, and metaxylem towards lower periphery. Leaf shows presence of cluster of calcium oxalate crystals and starch grains. It has also exhibit the presence of secretory cavities. The lamina of the leaf shows upper epidermis, mesophyll and lower epidermis.^[14-15]

PHYTOCHEMISTRY

A number of plants in the genus *Machilus* are sources of secondary metabolites with exciting chemical structures and important bioactivities. Flavonoids, butanolides, lignans, alkaloids, and sesquiterpenes have been reported from numerous species. The known chemical constituents of *Machilus* are around 140 include butanolides, flavonoids, lignans, sesquiterpenes, alkaloids, diterpenes, and others.^[6]

Gaiind KN and Baveja SK have carried out phytochemical investigation of roots. The alcoholic extract of the limed roots indicated presence of alkaloids. Machiline was the major alkaloid separated from the alcoholic extract, which later shown to be identical with dl-coclaurine, an alkaloid also reported in *Cocculus laurifolius* and *Machilus kusanoi*.^[16-17]

Garg ML., Joneja MP. and Baveja SK. isolated two more alkaloids (one of which was provisionally named macranthine) and β -sitosterol from the root.^[18] Gauda D. et al reported that bark contains arabinoxylan composed of arabinose (73%) and xylose (27%).^[19] Talapatra B. et al. isolated three norlignans namely machicendiol, machicenonol and machicenin along with sesamin, (+) pinoselinol dimethyl ether, egonol and homoegonol from the leaves. They also isolated one new alkaloid namely

machigline and atheroline and β -sitosterol-O-glucoside from the leaves.^[20]

PHARMACOLOGICAL STUDY

The pharmacological study was performed on the various extracts which are obtained from the parts of plant such as leave, steam bark & roots. The various pharmacological activities are as follows:

Hypotensive Effect: Hypotensive effects of machiline hydrochloride were reported by Gaind K.N. and Baveja S.K. The machiline was isolated from roots & the activity of machiline which was possibly due to its direct depressant effect on the myocardium of the test animals.^[16]

Anti-inflammatory activity: The stem bark extract of *Machilus macrantha* exist potent anti-inflammatory activity in carrageenan induced rat paw edema by Tatiya & Hatapakki. The ethanolic and aqueous extract showed dose dependant inhibition of rat paw oedema, at oral doses of 100 & 200 mg/kg/bw, when compared to control group. The activity was compared with standard drug, diclofenac sodium.^[7]

Kulkarni, et al also studied the crude extracts of the bark for acute inflammation and adjuvant-induced arthritis in rats. Similarly extracts were studied for anti-arthritic activity in adjuvant-induced arthritis in rats. The petroleum ether extract (PE) and aqueous extract (AE) caused a significant inhibition of the carrageenan-induced paw edema at a dose of 200 mg/kg, which was compared with control and reference drug, diclofenac. PE significantly decreased primary lesions, secondary lesions and total radiological score in adjuvant induced arthritis.^[21]

Tatiya & Saluja carried out the further studies on anti-inflammatory and FCA induced arthritic activity of bark of *Machilus macrantha* in rats. The various extracts & test material like petroleum ether (PE), alkaloidal fraction (CH), acetone extracts (TAN) mucilage obtained from *M. macrantha* bark were tested for membrane stabilizing, antinociceptive; anti-inflammatory and Freund's complete adjuvant (FCA) induced arthritis activity. At higher doses test materials have significantly ($p < 0.01$) inhibited paw edema after Carrageenan and histamine induction. Administration of test materials of *M. macrantha* (250 and 500 mg/kg b.w.), it were observed that significantly reduced abdominal writhing, formalin nociception, cotton pellet granuloma and vascular permeability in experimental animal, as well as, bark of *M. macrantha* showed chronic anti-rheumatic effect by suppressing the swelling volume, arthritis index, hematological and biochemical parameters (ESR, RA factor, CRP, liver transferase enzyme) in FCA-induced arthritis. It also significantly inhibited protein denaturation, heat-induced haemolysis of RBC and reduction in total leukocyte migration.^[22] Diclofenac

sodium and morphine were used as the reference standards during experiment.

Antiasthmatic and Antianaphylactic activity: The antiasthmatic and antianaphylactic activity of bark of *Machilus macrantha* was studied on the histamine and acetylcholine (Ach) induced bronchospasm in guinea pigs. Active and passive anaphylaxis in rats and mast cell degranulation induced by clonidine. Treatment with unsaponifiable matter from pet ether (USM) extract and alkaloids treated groups resulted significantly protection ($P < 0.001$) against acetylcholine and histamine aerosol-induced bronchospasm in guinea pigs. While treatment in active and passive sensitized rats with USM and alkaloid from stem bark of *Machilus macrantha* dose dependent level (at 50,100 mg/kg p.o) showed significantly reduction in number of disrupted mast cells ($P < 0.001$) in a intestinal mesenteric specimen of rats when challenged with antigen (horse serum), IgE levels ($P < 0.001$) in animal compared to untreated control and standard (prednisolone) and also showed significant reduction in blood eosinophil count in actively sensitized rats. It also significant protects the mast cell disruption induced by clonidine (ex-vitro).^[23]

Antihistaminic or Parasympatholytic activity: Pharmacological screening indicate that all extracts of *Machilus macrantha* bark showed competitive inhibitory activity (significant increase in Preconvulsion time) against bronchospasm induced by ach and histamine in guinea pigs. The extracts were compared with the standard drugs like Chlorpheniramine maleate and atropine. Chloroform and USM (unsaponifiable matter form pet ether extract) fraction of bark showed significant inhibition of histamine & Acetylcholine induced bronchospasm in guinea pigs.^[24]

Wound healing activity: Surana and Kumar reported the wound healing activity of methanolic extract of leaves of *M. macrantha* Nees, The methanol extracts was evaluated for their wound healing activity in rats using both excision and incision wound models. The effects of test samples on the rate of wound healing were assessed by the rate of wound closure, period of epithelialisation and wound breaking strength. The results of methanol extracts of *Machilus macrantha* leaves showed significant wound healing activity. Nitrofurazone (0.2% w/w) in simple ointment I.P. was used as reference standard.^[25]

Antioxidant, Cytoprotective & Antibacterial Activity Sharath & Prabhanjana reported the Antioxidant and Cytoprotective properties of leaf extract of *Persea macrantha* Nees. The aqueous and methanolic extracts of *Persea macrantha* were tested for radical scavenging activity, reducing power, inhibition of lipid per oxidation, DNA protection and cytoprotective effects. The aqueous and methanolic extracts exhibited the presence of total phenols/g of leaf. In addition to this, free radical scavenging activity was seen per 100 μ l of the

extracts. Methanolic extracts exhibited extra reducing power activity as well as DNA fortification property when compared to aqueous extract. In RBC cytoprotection & lipid peroxidation inhibition studies of aqueous and methanolic extract showed IC₅₀ value of 1.57 and 1.05 mg of phenols/ml & 8.88 µg and 17.89 phenol/ml respectively. In comparison methanolic extract exhibited more potency when compared to aqueous extract.^[26]

Antibacterial & radical scavenging activity of leaf & bark of *Persea macrantha* Nees was studied by Prashith et al. Antibacterial activity of methanolic extract of the leaf and bark was determined by Agar well diffusion assay. Antioxidant activity & Total phenolic content was determined by DPPH free radical scavenging assay & FCR method respectively. Among bacteria tested, *S. aureus* and *S. typhi* were inhibited to higher extent by extracts. The extracts scavenged DPPH free radical dose dependently. Bark extract displayed high radical scavenging potential than leaf extract. Total phenolic content was higher in bark than leaf extract. A direct correlation was observed between total phenolic content of extracts and radical scavenging activity.^[27]

CONCLUSION

The genus *Machilus* is well-known all over the world, and lots of species of this genus have been used as traditional herbal medicines. The chemical examination of *Machilus* species has exposed that numerous components from this genus, demonstrate significant bioactivities. *Machilus macrantha* possesses a range of significant pharmacological activities as discussed in the present review. In addition, it is imperative that more pre-clinical and clinical studies along with the establishment of improved quality control methods should be conducted to elucidate the uncultivated potential of this plant.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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