Review Article

An Overview of Phytoconstituents and Pharmacological Activities of *Celastrus Paniculatus* Wild

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ABSTRACT

Purpose: Herbal drugs are traditionally used in various parts of the world to cure a number of ailments. Celastrus paniculatus Willd is one such herbal plant which has been employed extensively in the treatment of several health conditions in traditional system of medicine. The current review is an effort to summarize the information based on evidence regarding the botanical aspects, phytoconstituents, traditional uses and pharmacological actions of Celastrus paniculatus. **Findings:** The leaves have healing effect on injuries while the seeds show significant action on the Central nervous system. The studies on laboratory animals demonstrated various pharmacological actions showing excellent activities on the brain. **Conclusion:** Celastrus paniculatus is a versatile plant, as all its plant parts possess the potential to treat several diseases due to the presence of various phytoconstituents. However these constituents have to be further isolated and characterized to check its activity on other common pharmacological disorders.

Keywords: *Celastrus paniculatus, Malkangani, Traditional medicine, Sesquiterpene polyalcohol, Phyto-pharmacology.*

INTRODUCTION

Celastrus paniculatus Willd belongs to the family Celastraceae. It is a small to medium sized woody species which is native to India and also widely distributed across countries like Malaysia, Thailand, China, Philippines, North eastern part of Australia[1]. Different parts of *Celastrus paniculatus* plant such as roots, bark, leaves and seeds are used for the treatment of several diseases and disorders[2]. *Celastrus paniculatus* plant contains several medicinal properties and are used for the treatment of arthritis, asthma, beriberi, bronchitis, cancer, body pain, abdominal disorders, cardiac debility and the plant also acts as an aphrodisiac and shows excellent brain tonic activities[3].

Botanical aspects[4]

Botanical name: Celastrus paniculatus Willd
Family: Celastraceae
Synonym: Celastrus dependens
Common names:
Hindi – Malkangani
Kannada – Kariganne
Telugu – Malkangani
English – Staff tree
Tamil – Valuluvai

Sanskrit – Jyotishmati
Marathi – Kanguni
Bengali – Kijri
Malayalam – Polulavam
Oriya – Korsana

Botanical description

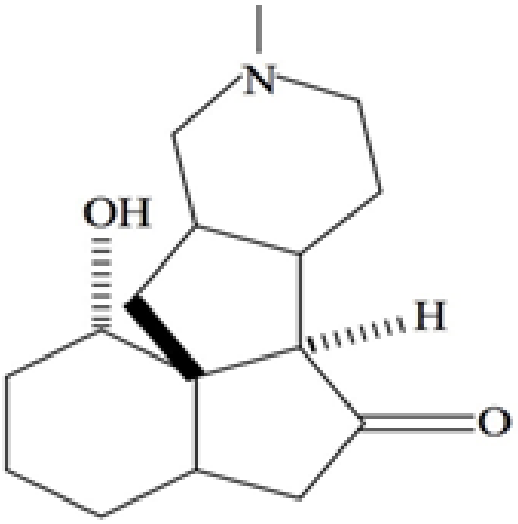
Celastrus paniculatus Willd is a small to medium sized woody species, whose branches are cylindrical shaped or with slight tapering without substantial furrows or ridges. The young shoots and branches have foliage or branching that weeps creating softness to the plant. Leaves do not contain hairs, they are broadest below the middle and roughly twice as long as it is wide (ovate) and shows a pointed or tapering (acuminate) shape. The flowers are yellowish-green in colour, borne in terminal and it possesses either stamens or carpels (unisex) but not both and is annually flowering. Fruits are capsule-globose shaped, 3-valved, 3-celled, 3-6 seeded. Seeds are ovoid or egg shaped and brown in colour, which contains a reddish specialized outgrowth that completely covers it.

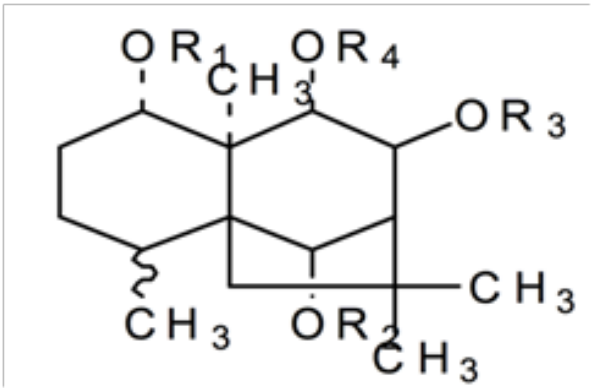
Phytoconstituents[5]

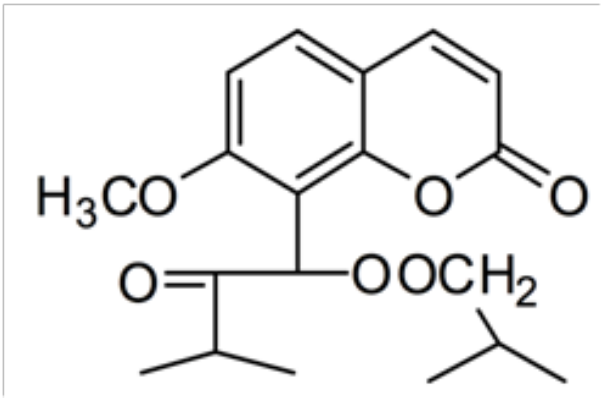
The cold-pressed expression of the seeds of *Celastrus paniculatus* was performed to obtain the raw herbal oil[6] which was brownish-yellow in colour. The expressed oil contained several phytoconstituents such as alkaloids, triterpenoids, esters, vitamin C, minerals, monounsaturated and polyunsaturated fats, carbohydrates, saturated fats, proteins and sesquiterpene polyolesters[7].

Alkaloids

Constituents such as Wifornine F, Paniculatine A and B were isolated from stem[8] where as the seeds were found to contain constituents such as Celastrine, Celapagine, Celapanigine and Celapanine[8,9,10]. Evonionatesesquiterpene alkaloids were found.







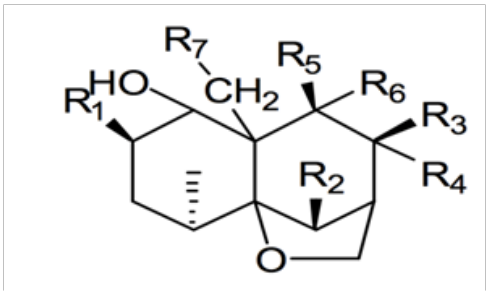
Celastrine **Paniculatine**

	R1	R2	R3	R4
Celapanine	Ac	Fur	Ac	Nic
Celapanol	H	H	H	H
Celapanigine	Ac	Bz	Ac	Nic
Celapagine	Ac	Bz	H	Nic

Major alkaloids of Celastrus paniculatus

Polyhydric alcohol.

Sugar alcohols such as Malkanguniol, Malkangunin, Paniculatadiol, Malkanginnol are found to be present.

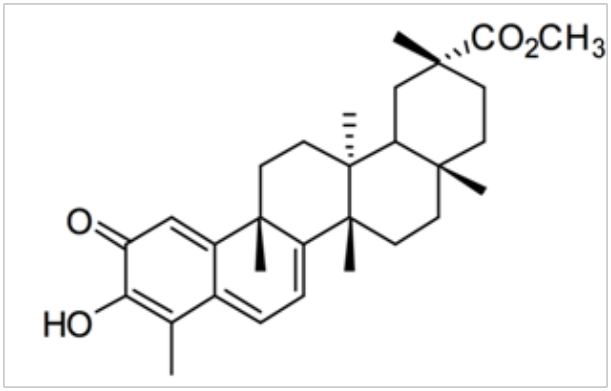


	R1	R2	R3	R4	R5	R6	R7
Polyalcohol A	H	OH	OH	H	H	OH	H
Polyalcohol B	H	H	H	OH	OH	H	H
Polyalcohol C	H	H	OH	H	OH	H	OH
Polyalcohol D	OH	OH	H	OH	OH	H	OH
Malkanguniol	H	OH	OH	H	OH	H	OH
Malkangunine	H	H	OAc	H	H	OBenz	OH

Polyhydric alcohols of *Celastrus paniculatus*

Triterpenoids

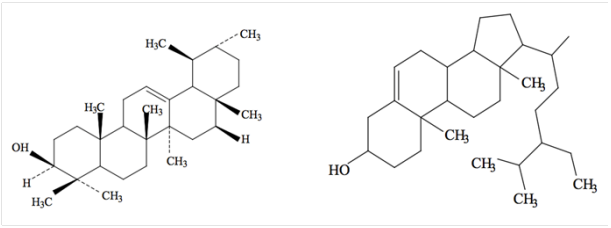
Triterpenoids like Pristimerin are present in *Celastrus paniculatus* plant[11].



Pristimerin

Steroid alcohol

Steroid alcohols such as β-amyrin and β-sitosterol are present in *Celastrus paniculatus.*



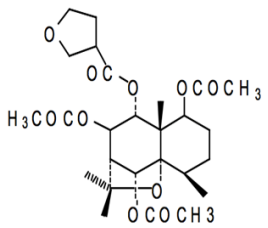
β-amyrin β-sitosterol

Sesquiterpenoid polyol esters

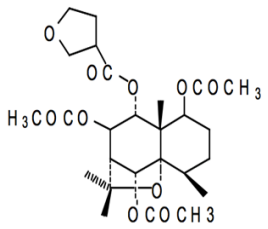
Two types of Sesquiterpene polyol esters has been isolated by the methanolic extraction of the *Celastrus paniculatus* seed oil[12]. Characterization of 1α, 8β, 14 - triacetoxy - 9β - furoyloxydihydro - β - agarofuran, 1α, β, 8β,14 - tetraacetoxy - 9β - benzoyloxydihydro- β - agarofuran and 1α, 8 β - diacetoxy - 9β - benzoyloxydihydro - β - agarofuran has been done from the extracts[13].

Bioactive components and their therapeutic uses of different parts of *Celastrus paniculatus*[14].

Plant part	Bio-active component	Therapeutic Uses
Leaves	Saponin	Shows anti-fungal and anti-microbial activity. Used in cough and infections by decoctions for tea.
Root bark	β-sitosterol, Pristimerin, Zeylasteral, Terpenes, Zeylasterone, Celastrol.	Used in the treatment of malaria.
Seed/ Seed oil	Alkaloids like Celastrine and Paniculatin, Fatty acids, Acetic acids, Benzoic acids, Sterol and tetracasanol[15,16]	It shows sedative and antidepressant actions. It shows febrifugal, nervine, emetic and diaphoretic properties. It is used to treat ulcers, infections and sores. It also shows tranquilizer action.



1β,6α,8β-triacetoxy-9α-(β-furncarbonyloxy)-β-dihydroagarofuran)



1β,6α,8β-triacetoxy-9α-(β-furncarbonyloxy)-β-dihydroagarofuran)

TRADITIONAL USES

*Celastrus paniculatus*has been used to treat leukoderma and cough. It is also used as emetic agent, appetizer, aphrodisiac and laxative in the traditional medicine system of India[17]. Charaka prescribed the decoction of the root and seeds for treating depression and headache due to its brain tonic actions and as a laxative for cleaning the gastrointestinal system. Sushrutha prescribed the use of the leaves to be chewed for purgative action and oil obtained by the *Celastrus paniculatus* seeds to be consumed orally for treating intestinal parasites, neurological disorders, skin infections, urinary tract infections and topically for wound healing. The leaves of the plant was said to be fried and fed orally for inducing menstruation by Chakradatta. He also reported that the juice obtained by the leaves to be used as a deaddiction aid and in opium poisoning[18]. In Ayurveda *Celastrus paniculatus* is used as a tonic for stimulation of the nerves, as a tranquilizer, sedative and diuretic which is dependant on the dosage regimen. It is said that its also used in the treatment of gout, rheumatism[19], asthma, leucoderma, leprosy and paralysis[20]. The bark of the plant is said to show abortificient and anti malarial activity[11]. *Celastrus paniculatus* has been used for centuries in the traditional medicinal systems for its antioxidant and brain stimulating effects[21]. The plants of *Celastrus* species including *Celastrus paniculatus* were used as natural insecticides in China[22]. In folk medicine *Celastrus paniculatus* was one of the most important plant which was used to treat joint pain, rheumatoid arthritis, fever, edema, chills and bacterial infection[23].

PHARMACOLOGICAL ACTION

Learning and memory

Studies conducted using aqueous extract of the *Celastrus paniculatus* seeds on cognitive functions of laboratory rats shows that memorizing and learning capacity improved by selectively reversing the spatial memory impairment which was produced by acute central muscarinic receptor blockade. Anticholinesterase action is not seen. The seed oil extracts were also studied for its effect on learning and it showed a significant increase in the retention ability of the rats treated with the extract when compared with control groups which were administered saline[24].

Antioxidant

DNA damage and cytotoxicity were induced in human non immortalized fibroblasts by using H_2O_2 and was

treated by aqueous extract of *Celastrus paniculatus* which showed protective effect on DNA cleavage and free radical scavenging activity in a dose dependent manner[25].

Analgesic and Anti-inflammatory

Alcoholic extract of the seeds of *Celastrus paniculatus* exhibits significant antinociceptive effects in both tail immersion and hot plate tests, which showed the opoid mechanisms involvement. It also inhibited writhing, which was induced by acetic acid, by inhibiting the cyclooxygenase and inflammatory mediators[26].

Hypolipidaemic

Methanolic extract of the seeds of *Celastrus paniculatus* At the dose of 65mg/kg showed reduction in the LDL cholesterol, Triglycerides and the plasma total cholesterol levels in experimentally induced Hypercholestremic rats. HDL cholesterol level was found to be increased. Degradation of cholesterol into neutral sterols is increased due to enhanced hepatic bile acid synthesis[27].

Sedation and anti convulsion

The oil obtained from the seeds of *Celastrus paniculatus* showed anticonvulsant effect in rats and was found to exhibit sedative effects in rats, mice, cats and monkeys[28].

Anti-arthritic activity

The petroleum ether fraction of *Celastrus paniculatus* seeds was found to reduce arthritic progression in rats with respect to body weight, paw swelling, Arthritic score, hyperalgesic effect by suppression of inflammatory cytokines, oxidant stress markers and cellular enzymes like alkaline phosphatase (ALP), aspartate transaminase (AST) and alanine transaminase (ALT). The decreased levels of superoxide dismutase (SOD), catalase (CAT) and glutathione (GSH) were also restored[29].

Anti-fertility

The rats treated with oil extracted from the seeds of *Celastrus paniculatus* showed repair and regenerative changes in testis of rats with regards to vacuolization, depletion of germ cell and arrest of spermatogenesis[30].

Wound healing

Petroleum ether extract of *Celastrus paniculatus* leaves contains a triterpene compound called lupeol. It shows a high wound contraction rate, which is associated with wound healing activity[31].

Anti-malarial

Quinonoidtriterpene and pristimerin are the active constituents, which showed highest antimalarial activity among other solvent extracts against *Plasmodium falciparum* and have been isolated from the chloroform extract of *Celastrus paniculatus* root bark[11].

Anti bacterial

Several extracts and oils were tested against various microbes and it was witnessed that the oil and the aqueous extract of the seeds of *Celastrus paniculatus* showed good antibacterial effect against microbes such as *Micrococcus pyogenes, Bacillus cereus, Salmonella typhosa, Bacillus subtilis, Salmonella dysentrica, Salmonella paratyphi, Salmonella marcescens, Escherichia coli, Proteus vulgaris, Pseudomonas pyocyana, Pseudomonas morganii, Pseudomonas aeruginosa, Staphylococcus lutea, Staphylococcus aureus and Klebsiella pneumonia*[29,33].

Anti fungal

The ethanolic extracts of *Celastrus paniculatus* showed a strong inhibitory effect against several species namely *Trichophyton mentagrophytes, Trichophyton rubrum, Trichophyton soudanense, Candida albicans, Torulopsis glabrata, and Candida krusei* when screened for their anti-fungal activity[34].

Anti depressant

The immobility period of both stressed and unstressed mice was greately reduced by using seed oil of *Celastrus paniculatus* in forced swim test due to inhibition of MOA-A activity in brain and reduction of nitrate levels in the plasma. It also restored the sucrose preference in stress induced mice by decreasing the corticosterone levels in the plasma which indicates a significant anti depressant like activity[35].

Anti ulcer

The oil obtained from the seeds of *Celastrus paniculatus* exhibited gastroprotective effect when screened for anti ulcer activity in different models for rats. In pyloric ligation model, the total volume of gastric acidity and gastric juice was reduced while the gastric pH was increased.

In ethanol induced and indomethacin induced ulcer model, the gastroprotective effect is due to inhibition of Tumor necrosis factor-a, Interleukin-6, proinflammatory cytokines and increase in interleukin-10. These findings indicate the gastroprotective potency of *Celastrus paniculatus* seed oil[36].

Anti Alzeheimer

The organic soluable fraction obtained from methanolic extract of *Celastrus paniculatus* seeds which includes the fraction of n-butanol, ethyl acetate and dichloromethane exhibited anticholinesterase acticity in moderation. It also shows cholinesterase inhibitory effect which were found to be statistically significant with respect to IC50 values. These obeservations indicates that with further isolation and characterization of the chemical compounds, it can be used to treat Alzheimer's disease effectively[37].

CONCLUSION

From the above review, it can be concluded that *Celastrus paniculatus* is a versatile plant due to its potency to treat several health conditions. The seeds, fruits, leaves, root were shown to possess several chemical constituents which shows excellent mental actions, antimicrobial action, gastroprotective and lipid lowering actions. The researchers working in several other laboratories have also found that it possesses analgesic property and can also be used to treat conditions like arthritis, malaria. Therefore the investigation of the plant must be continued to find out its therapeutic potential in other common pharmacological conditions like diabetes mellitus, obesity, hypertension and cardiovascular disorders.

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