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REVIEW

Phytopharmacological Perception on Jyotismathi–An Ayurvedic Herb

Arun, A. Anbu, E. Selvakumari* and V. Gopal
Dept. of Pharmacognosy, College of Pharmacy, Mother Theresa Research Institute of Health Sciences, Puducherry, India
selvakumari_7@yahoo.co.in*; +91 9787760577

Abstract

Jyotismathi (*Celastrus paniculatus*) is a traditional ayurvedic medicinal plant used as a memory enhancer and in the treatment of brain related disorder. Jyotismathi oil extracted by cold expression of the seed of *Celastrus paniculatus* is known for its stimulatory effect on central nervous system. This review gives the detailed documentation of *Celastrus paniculatus* on its ethnobotany, taxonomy, pharmacognosy, phytochemistry and pharmacological studies. Therefore, the investigation should be extended up to the molecular mechanism and clinical studies that will provide a lead molecule for memory enhancing properties.

Keywords: *Celastrus paniculatus*, memory enhancer, Jyotismathi oil, ethnobotany, phytochemistry.

Introduction

Celastrus paniculatus belongs to the family Celastraceae, a large woody climbing shrub distributed all over India up to an altitude of 1800 meters. It is commonly known as malkangani in Hindi, staff tree in English, kariganne in Kannada and valuluvai in Tamil. In Ayurveda system of medicine, it is used as a memory enhancer. The oil obtained from the expression of the seeds is prescribed internally for neurological disorders and used as brain tonic. The different formulations are jyotismathi thaila (Ayurveda) and roughage-malkangani (homeopathy). This review gives updated information on ethnobotany, taxonomy, pharmacognosy, phytochemistry and pharmacological studies.

Ethnobotany

In Himalayan region, the folklore medicine *Celastrus paniculatus* is reported in the treatment of hemorrhoids, piles, gout, rheumatism, dysentery, diarrhoea, leprosy, snake-bite and wounds. In Himachal Pradesh, the fruit juice of *C. paniculatus* is used as cardio-tonic and seeds as appetizer. The leaves and roots of *C. paniculatus* are used for headache by the local people of Haridwar district and Uttaranjal. In folk medicine, crushed roots are used in pneumonia. Among the Gond tribe of Uttar Pradesh, the powdered root is considered useful for the treatment of cancerous tumors. In Madhya Pradesh, the powder of the roots and the decoction of seeds are used to treat rheumatism (Mohsen, 2015). Herbal venders of South India use the seeds of *C. paniculatus* in the ointments which are externally applied on the wound. The Jyotismathi oil extracted from the seeds of *C. paniculatus* is known to treat acute and chronic immobilization stress. The oil obtained from seeds possesses sedative and anti-convulsant properties. Seed oil has found to be beneficial to psychiatric patients, and increased the intelligence quotient of mentally retarded children (Mohsen, 2015).

Fig. 1. C*elastrus paniculatus.*

Taxonomy

The plant belongs to the kingdom plantae, Class angiospermae, order celastrales, family celastraceae, genus *Celastrus* and species *paniculatus* (Neha and Shashi, 2012).

Pharmacognosy

The transverse section of midrib shows the presence of upper and lower epidermal cells 2-5 rows of collenchyma cells on the ventral side and 2-4 on the dorsal side, collateral vascular bundles, sclerenchyma cap, idioblast calcium oxalate crystals (kalaskar *et al.,* 2012). The presence of epidermal cells, prismatic crystal of calcium oxalate, stone cells, oil globules, fibers and aluerone grains, animocytic stomata, bicellular and multicellular covering trichomes were reported in the powder microscopic analysis of *C. paniculatus* (Manu *et al.,* 2012).

Physico-chemical parameters such as refractive index 1.479% w/w, specific gravity 0.9170% w/w, acid value 1.169% w/w, iodine value 59.85% w/w and saponification value 182.71% w/w is reported for Jyotismathi thaila (Manu *et al.,* 2012).

Phytochemistry

HPTLC finger print: HPTLC finger prints of Jyosmathi thaila were reported by spraying the plate with Libermann buchard's reagent (Manu *et al.,* 2012).

Phytochemical analysis: Presence of alkaloids, carbohydrate, sterol and triterpenoid phenolic compound, flavonoid, tannins, saponins and fixed oil were also reported in the leaves of *C. paniculatus* (Avinas and Wamen, 2014).

Fatty acid composition of Celastrus paniculatus seed oil: Saturated fatty acids namely butyric acid, caprylic acid, lauric acid, myristic acid, palmitic acid, stearic acid, arachitic acid, mono saturated fatty acids viz., palmitoleic acid, oleic acid, poly saturated fatty acids viz., linoleic acid, eicosadienoic acid, arachitonic acid is reported from the seed oil of *C. paniculatus* (kaewsopak *et al.,* 2013).

Alkaloids: Celastrine, paniculatine, sesquiterpene alkaloids viz., celapanin, celanigin, celapagin were reported in *Celastrus paniculatus.*

Terpenoids: Sesquiterpenoids viz., dihydro garofuran, quinonemethide and phenolic triterpenoids viz., celatrol, spristimerin, zelasterone, zeylasteral were reported in *C. paniculatus* (Neha and Shashi, 2012).

Ester compounds: Sesquiterpene polyol ester viz., malkanguniol, malkangunin, celapanine were reported from *C. panicutatus* (Neha and Shashi, 2012).

Steroids: Beta-sitosterol, celastral, pritimerin, zeylesterone, zeylasterol, terpenes were reported from root bark of *C. paniculatus* (Neha and Shashi, 2012).

Pharmacology

Neuromodulating effect: The alkali extract of *Celastrus paniculatus* prevents aluminum induced neurotoxicity in the cerebral cortex, hippocampus and cerebellum of the rat brain. It significantly decreased the level of GSH and activities of SOD, CAT, GPx, GR, sodium/potassium ATPase and Mg^{2+} ATPase and increased the level of LPO and the activities of ALP, ACP, ALT and AST in all the brain regions when compared with control rats (Sumathi *et al.,* 2013).

Anti-nociceptive & anti-inflammatory activity: Jyotismathi seed extract reported to possess significant activity in Swiss albino mice by tail immersion, hot plate and acetic acid induced writhing test models (Sumathi *et al.,* 2013). The alkali and methanolic seed extract is reported for anti-inflammatory activity by carrageenan induced hind paw edema method on the albino rats and compared with diclofenac sodium (Sudha *et al.,* 2009).

Nootropic activity: Celastrus paniculatus whole plant methanolic extract was reported for its significant nootropic activity. It significantly improved the learning and memory of rats, as medicated by the decline in transfer latency using elevated plus maze and also decreased in escape latency during and retrieval morries water maze (Anandha, 2015).

Anti-convulsant activity: The anti-convulsant activity of seed oil was examined against leptazole, picrotoxin and strychnine-induced convulsions in rats. It increased strychnine convulsions and reduced leptazole toxicity. It produced calming effect in injected rats, potentiated pentobarbitone sedation and exerted antispasmodic activity with respect to acetylcholine but did not significantly affect the amphetamine toxicity.

Memory enhancing activity: Oral administration of 1 mL of 5% emulsion of seed oil for 3 d enhanced the learning process in albino rats which was comparable to that of vasopressin. The memory process also improved which was more prominent in 7 d treated animals than in 3 d treated animals. The effects were comparable to that of vasopressin (Karanth *et al.,* 1980).

Tranquilizing effect: Seed oil produced a tranquillizing effect on rats, mice, monkeys and cats in a dose of 200 mg/kg. It potentiated the effect of hexobarbitone and produced hypothermia in mice. The fraction also decreased spontaneous motor activity, amphetamine-induced hyperactivity, orientation hyperactivity and oxygen consumption in mice (Sheth *et al.,* 1963).

Cognitive enhancing properties: The effect of *Celastrus paniculatus* seed oil was studied using Morris water maze apparatus on the 6^{th} d performance of young adult rats. Chronic oral administration of seed oil (50, 200, or 400 mg/kg) for 14 d completely reversed the scopolamine (0.5 mg/kg)-induced task performance deficit. On the other hand, acute treatment of *C. paniculatus* (200 mg/kg) did not significantly reverse the scopolamine-induced impairment in maze performance. Thus, the seed oil of *C. paniculatus*, when administered chronically, selectively reversed the impairment in spatial memory produced by acute central muscarinic receptor blockade, supporting the possibility that one or more constituents of the oil may offer cognitive enhancing properties (Gattu *et al.,* 1997).

Effect on cardiovascular system: The crude *Celastrus paniculatus* seed oil administered with emulsion (50-100 mg/kg) produced a gradual fall in cardiac output, bradycardia and marked increase in pulse pressure on isolated heart lung preparation in cat. A similar action with 1 g of emulsified oil was also observed in dogs (Gaitonde *et al.,* 1957). The aqueous extract of *C. paniculatus* seed showed 50% angiotensin converting enzyme (ACE) inhibition; ethanol extract showed mild activity while the acetone extract was devoid of it (Saomnadhan *et al.,* 1999).

Conclusion

Celastrus paniculatus is an Indian medicinal plant which was used for thousands of years in traditional system of medicine. Oil which is obtained from the seeds of *Celastrus paniculatus* is reported for its stimulating effect on memory. This review gives a detailed information on various ethnobotanical uses, pharmacognostical studies, viz., section of midrib, powder microscopy characters, physicochemical parameters, phytochemical studies viz., HPTLC finger prints, preliminary phytochemical analysis, fatty acid composition of seed oil, alkaloids, ester compound, steroids, pharmacological studies viz., neuromodulating effect, antinociceptive and anti-inflammatory activity, nootropic activity, anti-convulsant, memory enhancing activity, tranquillizing effect, cognitive enhancing property, effect on cardiovascular system and anti-malarial activity. The data mining on *Celastrus paniculatus* will be useful for the researches to identify potent lead molecule for the future drug discovery.

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