A REVIEW ON PHARMACOLOGICAL ACTIVITIES OF CELASTRUS PANICULATUS.

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Abstract

Celastrus paniculatus Willd. is an important Ayurvedic medicinal plant gaining popularity in the primary healthcare systems and in herbal drug formulation. According to reports, the oil extracted from the plant's seeds is extremely good for boosting cognition and enhancing memory. It may also function as a nervine tonic, a rejuvenator, and an antidepressant. Many other actions, including analgesic, anti-inflammatory, hypolipidemic, neuroprotective, and nootropic activity, have also been documented for various seed extracts. The plant's leaves exhibit strong anti-fungal and anti-microbial properties. The root bark exhibited antimalarial activity.

Keywords: *Celastrus paniculatus, evaluated, seed oil, seeds.*

1. INTRODUCTION.

Celastrus paniculatus Willd belongs to the family Celastraceae and is a large, woody, climbing shrub, distributed almost all over India and is known for its ability to improve memory [1]. *Celastrus paniculatus* is commonly known as the "Black seed oil plant". It is a massive, climbing, deciduous, unarmed shrub that grows to 10 meters. It has a reddish brown stem that can reach a diameter of 23 cm, long listicles, and long, thin, elongated branches. There are simple, alternating, 6 to 10 cm long leaves. Petioles are 6–12 mm long, crenulate, coriaceous, glabrous, oval or obovate, slightly acuminate, crenate serrate in the upper portion, and normally whole at the base. A crimson, fleshy aril completely envelops seeds 1-6, which are frequently solitary. The plants grow as scandent bushes on mountain tops or as climbers on hillside slopes.

The Ayurvedic system of traditional medicine, which dates back thousands of years, uses this plant to treat a wide range of diseases. This plant has a wonderful reputation for the treatment of nervous system problems, brain tonics, and cognitive impairment [2]. This plant's seed has a diverse spectrum of medicinal properties for the treatment of the brain, nootropic activity, and other related illnesses as well as cognitive deficiencies, the seed oil derived from CP has been employed in the local system of medicine. The CP preferentially helps to recall memory and also regulates serum biochemistry. It improves nervous system functionality, nourishes neuronal cell lines, increases nervous resistance, and has mild calming effects. Furthermore, it has been found that the plant extract demonstrates several pharmacological effects [3].

Botanical aspects.

Botanical name: *Celastrus paniculatus* Willd

Family: Celastraceae

Synonym: Celastrus dependens Vernacular names: Hindi – Malkangani; English – Staff tree; Kannada – Kariganne; Tamil – Valuluvai; Telugu – Malkangani.

Botanical description: *Celastrus paniculatus* Willd. is a climbing or scrambling shrub, with terete branches; the young shoots and branches are pendulous.

Leaves – glabrous, broadly ovate or obovate, acuminate or acute.

Flowers – unisexual, yellowish-green, borne in terminal, pendulous panicles (flowering throughout the year).

Fruit – capsule, globose, 3-valved, 3-celled, 3-6 seeded.

Seeds are enclosed in complete red arillus, ovoid, brown

2. PHARMACOLOGICAL ACTIVITIES.

Antioxidant

The *Celastrus paniculatus* methanolic extract was proven to have antioxidant properties and also the ability to reduce the DNA damage induced by hydrogen peroxide in human non-immortalized fibroblasts [4].

The ability of the *Celastrus paniculatus* plant's methanolic extract to scavenge free radicals and its impact on DNA breakage brought on by UV-induced hydrogen peroxide photolysis were both examined. The findings show that the *Celastrus paniculatus* extract has intriguing antioxidant characteristics, as evidenced by its ability to scavenge superoxide anion and hydroxyl radicals and lessen the cytotoxicity and DNA damage caused by hydrogen peroxide in human fibroblast cells. The ability to scavenge free radicals was examined in three aqueous extracts made from *Celastrus paniculatus* seeds: a room temperature extract, a hot water extract, and an acid extract.

Every aqueous extract demonstrated a dose-dependent capacity to scavenge free radicals for the 1, 1-diphenyl-2-picryl-hydrazyl radical, as well as for assays that generated superoxide (in vitro assays). All of the aqueous extracts considerably reduced the amount of hydrogen peroxide that caused neuronal death, but the acid extract was the most effective at preventing the oxidative damage that hydrogen peroxide causes to the neuronal cells. Using enriched neuronal cell culture, researchers looked into the superoxide scavenging properties of *Celastrus paniculatus* seed oil and two extracts, ethanolic extract and methanolic extract, as well as their neuroprotective effects against H2 O2-induced oxidative stress and glutamate-induced toxicity. Free radical scavenging capacity in *Celastrus paniculatus* seed oil and the ethanolic extract was dosage dependent, but to a lesser extent than that seen in methanolic extract [5].

Wound healing activity

Excision, incision, and dead space wound models on Swiss Albino rats were used to test the wound-healing abilities of the triterpene lupeol, which was extracted from petroleum ether extract of *Celastrus paniculatus* leaves (175-225 g).

Wound healing activity was significantly higher (17.83+/-0.48) in lupeol-treated groups than it was with nitrofurazone, a common skin ointment (18.33+/-0.42). In comparison to the control group, there was a higher rate of wound contraction and faster epithelialization of the incision wound (571.50+/-5.07).

Lupeol's ability to promote wound healing was further supported by nitrofurazone and standard medication nitrofurazone compared docking to glycogen synthase kinase 3-beta protein through the Wnt signaling pathway [6].

Antibacterial

Antibacterial activity of leaves.

Celapanin, a sesquiterpene derivative, celapanin was isolated from the acetone soluble fraction of an ethanol extract of *Celastrus paniculatus* leaves. The antibacterial efficacy of the crude ethanol extract and the extracted purified ingredient celapanin was tested against 30 clinical strains of Gram-negative Pseudomonas aeruginosa, Gram-positive Staphylococcus aureus, and Klebsiella pneumonia that was isolated from various pathogenic sources.

Concentrations of the ethanol extract and celapanin, a component, more than 100 g/100 L and 50 g/100 L respectively, suggested that they had bacteriostatic effects.

Clinical strains of Staphylococcus aureus that were isolated from pus samples of old wounds of sick individuals grew most slowly when treated with ethanol extract and the component celapanin.

Clinical strains of Gram-negative Pseudomonas aeruginosa and Klebsiella pneumonia isolated from urine samples of infected patients' urinary tracts displayed a moderate zone of inhibition by the ethanol extract and component celapanin-loaded wells [7].

Antibacterial activity of seeds

By using the cup-plate method, the CP seed oil demonstrated antibacterial action against the following bacteria: Bacillus subtilis, Corynebacterium diphtheriae, Salmonella typhosa, Salmonella paratyphi A and B, Escherichia coli, Proteus Vulgaris.

Escherichia coli, Staphylococcus aureus, Bacillus cereus, Salmonella dysenteric, Klebsiella pneumonia, and Proteus Vulgaris were tested for in vitro antimicrobial activity against the oil at various concentrations (20, 40, 60, 80, and 100 percent), as well as against the fungi Aspergillus niger, Aspergillus flavus, Penicillium sp, and Trichoderma sp.

The aqueous extract of *Celastrus paniculatus* seed demonstrated potent antibacterial activity against Bacillus cereus, Klebsiella pneumonia, Proteus morganii, Proteus Vulgaris, Salmonella typhosa, Salmonella paratyphi A, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus lutea, Staphylococcus aureus but was found inactive against Bacillus subtilis and Salmonella paratyphi B [5].

Antifungal

At various concentrations, the antifungal activity of methanolic crude extracts of Acorus calamus, Tinospora cordifolia, and *Celastrus paniculatus* was examined against Alternaria solani, Curvularia lunata, Fusarium sp, Bipolaris sp, and Helminthosporium sp. *Celastrus paniculatus* had improved effectiveness against Alternaria solani and Helminthosporium at 5000 ug/ml.

Concentrations of 1000, 2000, and 3000 mg/ml brought minimal inhibition against test fungi. Higher quantities of the methanolic extract, which was tested at 5000 g/ml against a variety of pathogenic fungi, were found to be efficient [8].

Analgesic and anti-inflammatory.

Swiss albino mice were used in acetic acid-induced writhing testing to test the analgesic efficacy of various solvent extracts of *Celastrus paniculatus* leaves. Mice were used to test the peripheral (non-narcotic) analgesic effectiveness of *Celastrus paniculatus* leaf extracts using the acetic acid-induced writhing method. Each test extract had strong peripheral analgesic effects. The petroleum ether and ethyl acetate extracts were determined to be the next most potent after the methanol extract. This preliminary study demonstrates the marked analgesic activity of *Celastrus paniculatus* leaf [9].

Using the tail immersion, hot plate, and acetic acid-induced writhing tests, the seeds of *Celastrus paniculatus* were examined for their antinociceptive effect in Swiss albino mice at doses of 250, 500, and 1,000 mg/kg.

At a dose of 250 mg/kg, *Celastrus paniculatus* significantly increased the tail withdrawal reaction in the tail immersion test, with a maximum effect of 15.71 percent. The maximum possible effect of 23.32% and 30.16% ($P < 0.001$) was seen at doses of 500 and 1000 mg/kg at 3 hours after administration of the extract, respectively. Increases in paw licking time were observed in the hot plate test at doses of 500 and 1000 mg/kg. At 90 minutes, *Celastrus paniculatus* (1,000 mg/kg) displayed the highest reaction (6.23 ± 0.46), compared to the control (3.20 ± 0.18).

In acetic acid-induced writhings, alcoholic extract of *Celastrus paniculatus* seeds at doses of 250, 500, and 1,000 mg/kg body weight showed 32.35%, 49.01%, and 58.82% inhibition in writhings, respectively.

In a model of carrageenan-induced acute plantar inflammation in Wistar rats, anti-inflammatory activity was assessed. When compared to control mice, *Celastrus paniculatus*-treated animals (500 and 1,000 mg/kg) demonstrated a substantial reduction in paw edema at 3 hours and 4 hours [10].

Anti fertility

The antifertility potential of a crude ethanolic extract of Celastrus paniculans L. was investigated. Spermatogenesis was significantly inhibited when given orally for 45 days to cover the majority of the spermatogenesis process at a dose level of 250 mg/kg body weight. The weight of both the primary and secondary reproductive organs was significantly reduced. The count and motility of sperm in the cauda epididymis were found to be declining [11].

Nootropic activity

Using the elevated plus maze and the passive avoidance test, the effects of *Celastrus paniculatus* Willd. (Celastraceae) seed aqueous extract was assessed for learning and memory. Rats and mice received two separate oral doses of the aqueous seed extract (350 and 1050 mg/kg and 500 and 1500 mg/kg, respectively). The outcomes contrasted with the reference medicine, piracetam (100mg/kg, p.o.). Following acquisition training, sodium nitrite (35 mg/kg) was administered subcutaneously to cause chemical hypoxia.

The effect of the extract of *Celastrus paniculatus* (350 and 1050mg/kg, p.o.) in rats revealed a significant reduction in transfer latency of 37.46 and 55.33%, respectively. Therefore, the significant decrease in transfer latency of the *Celastrus paniculatus* extract compared to the control group suggests that the rats' cognitive function has improved.

Sodium nitrite-induced cognitive deficit in mice was indicated by a decrease in step-down latency during retention (at 24h and on day 15) trials. When compared to the control group (mice treated with NaNO2), the mice were given the extract and the common medication piracetam displayed an increase in step-down latency on day 15. On day 15, the hypoxic impairments of retention were significantly corrected by piracetam and both doses of *Celastrus paniculatus.*

Acetylcholinesterase activity was significantly reduced by piracetam and *Celastrus paniculatus* (both at higher and lower doses) compared to control. As a result, these medications enhanced the memory of rats by blocking the acetylcholinesterase enzyme and raising the level of acetylcholine in the rat brain [12].

Hypolipidemic effect

The hypolipidemic action of *Celastrus paniculatus* methanolic extract was examined in experimentally produced hypercholesterolemic rats. Feeding the animals a high-fat diet caused the animals to develop hypercholesterolemia. The plasma total cholesterol, triglycerides, and LDL cholesterol were significantly decreased when methanolic seed extract (50%) of *Celastrus paniculatus* was administered orally at the optimal dose of 65 mg/kg body weight compared to the generated hypercholesterolemic animal group. In addition, treated animals' atherogenic index and liver weight were significantly decreased as compared to the hypercholesterolemic animals.

In high cholesterol diet animals, the seed extract also decreased cholesterol buildup in the aorta. These findings suggest that animals fed with a high-fat diet and seed extract were able to reduce lipid buildup in the aorta [13].

Neuroprotective effect

The neuroprotective potential of *Celastrus paniculatus* oil was examined for chronic stress-related cognitive impairment. Rats were placed into restraints for six hours each day for a total of 21 days to induce chronic stress. Following the stress procedure, *Celastrus paniculatus* oil (400, 600 mg/kg) or vehicle was given intraperitoneally (i.p.) once daily for the following 14 days. Following medication therapy, anxiety-like behavior was examined using open field and elevated plus mazes (EPM), and spatial learning and memory capacities were assessed using partially baited radial arm mazes (RAM) and T-mazes.

Stressed rats showed enhanced anxiety-like behavior in the elevated plus mazes test (P 0.001) and impaired performance in the radial arm mazes and T-maze tasks (P 0.001) compared to normal animals. In contrast, these rats' performance in the RAM and T-maze improved after receiving CP oil treatment (P 0.001). Additionally, CP oil considerably decreased stress-induced anxiety behavior (P 0.001) [14].

Ameliorating effect

Celastrus paniculatus was evaluated against 3-nitropropionic acid (3-NP) induced Huntington's disease (HD) like symptoms in Wistar male rats, *Celastrus paniculatus* ethanolic extract (CPEE) (100 and 200 mg/kg) and its various fractions, including petroleum ether (40 mg/kg), ethyl acetate (2.5 mg/kg) administered orally for 20 days, against 3-NP (10 mg/kg, i.p. for 14 days) was assessed by their effect on body weight, locomotor activity,

grip strength, gait pattern and cognitive dysfunction and biochemical parameters for oxidative damage in the striatum and cortex regions of the brain.

In comparison to rats only receiving 3- nitropropionic acid treatment, animals treated with *Celastrus paniculatus* ethanolic extract (CPEE) (100 and 200 mg/kg) showed a significant ($p<0.05$) improvement in behavioral and oxidative stress indices. The aqueous fraction (AF) of the extract of *Celastrus paniculatus*, which was tested at 18 mg/kg, showed the greatest ability to reverse the behavioral and biochemical changes caused by 3-nitropropionic acid. It was also tested at 9 and 36 mg/kg. When compared to the 3- nitropropionic acid-treated rats, *Celastrus paniculatus* ethanolic extract (CPEE) (100 mg/kg) and aqueous fraction (AF) (36 mg/kg) showed the greatest and most significant (p 0.05) attenuation of 3- nitropropionic acid-induced changes [15].

Antimalerial

Using an in vitro culture system, crude solvent extracts from the root, bark, and stem of *Celastrus paniculatus* were tested for antimalarial activity against Plasmodium falciparum. The root bark's chloroform extract portion had the strongest antimalarial activity. The chloroform fraction included an active ingredient, which was separated, described, and identified as pristimerin, a quinonoid triterpene. Pristimerin was less active than the tested standard antimalarial medications in invitro tests against various multidrug-resistant isolates of strains of P. falciparum [5].

Antidepressant

Celastrus paniculatus seed extract was evaluated for antidepressant activity by conducting a forced swim test and tail suspension test. The immobile duration in the forced swimming test and the tail suspension test was shown to be shorter when *Celastrus paniculatus* seed extract was used, and the reserpine-promoted lengthening of immobility in mice was shown to be reversed. similar to imipramine (IMI), the test drug extracts also reduce ptosis and catalepsy brought on by reserpine in rats, showing that the substance has antidepressant potential. Due to inhibition of MOA-A activity in the brain and a decrease in plasma nitrate levels, the seed oil of *Celastrus paniculatus* significantly decreased the immobility period of both stressed and unstressed mice in the forced swim test. It also restored the sucrose preference in stress-induced mice by lowering corticosterone levels in the plasma, which indicates a significant antidepressant-like activity [4].

3. CONCLUSION.

Recently herbal medicine has been preferred over synthetic medicine throughout the world and approximately 80% population still relies on plants. The information mentioned above about these versatile medicinal plant *Celastrus paniculatus* indicates that *Celastrus paniculatus* is a true elixir of life. Therefore, given the therapeutic importance of this plant, extensive clinical trials are needed to develop effective therapeutic modalities.

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