

The Phytochemistry, Pharmacology, and Therapeutic Potential of *Celastrus Paniculatus* Willd., the Intellect Tree

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Abstract—*Celastrus paniculatus* Willd. (Celastraceae), commonly referred to as “Jyotishmati” or the “Intellect Tree,” has been esteemed in Ayurveda, Unani, Siddha, and folk medicine for its cognitive-enhancing and medicinal properties. Sources from the past emphasize its function as a medhya rasayana, utilized to enhance memory, concentration, and neurological health, whilst ethnomedicinal traditions expand its use to rheumatism, dermatological disorders, and gastrointestinal diseases. Recent plant-based studies show that seeds and seed oil, which are the main medicinal parts, contain a wide range of bioactive compounds, including alkaloids, sesquiterpenes, triterpenoids, sterols, fatty acids, and flavonoids. These components provide extensive pharmacological profile, exhibiting antioxidant, anti-inflammatory, neuroprotective, hepatoprotective, anxiolytic, anti-arthritis, and cognition-enhancing properties. Preclinical findings underscore its potential in the treatment of neurodegenerative illnesses, including Alzheimer's and Parkinson's disease, with mechanisms such as acetylcholinesterase inhibition, reduction of oxidative stress, and neuronal protection. Evidences indicate its potential applications in reproductive health, metabolic regulation, antimicrobial therapy, and wound healing, besides neurology. Current biotechnology methodologies—such as tissue culture, metabolic engineering, and nanotechnology-based delivery systems—present potential solutions for eco-friendly production and improved therapeutic effectiveness. However, concerns about overharvesting, standardizing quality, and limited clinical validation are compelling to take steps to protect the environment and do in-depth scientific research. In general, *C. paniculatus* is an interesting mix of ethanognosis and current pharmacology. It has a lot of potential as a natural nootropic and phytopharmaceutical resources for taking care of contemporary health issues.

Keywords— *Celastrus paniculatus*, Phytochemistry, Ethnomedicine, Neuroprotection, Cognition enhancement.

I. INTRODUCTION

Celastrus paniculatus Willd. (family Celastraceae), commonly referred to as the “Intellect Tree” or “Jyotishmati,” occupies a significant position in the annals of traditional medicine. This big, woody climbing shrub has been known for hundreds of years in South and Southeast Asia, especially in India, where it is highly regarded in Ayurveda, Unani, and Siddha medical systems (Aleem, 2021). Ayurvedic scriptures from long ago name *C. paniculatus* a powerful medhya rasayana, which means it can help improve memory, focus, mental clarity, and intelligence. The seeds and the golden-yellow seed oil are

highly prized, giving the plant the nickname “elixir for the brain.”

Classical Ayurvedic texts like the Charaka Samhita and Sushruta Samhita show how important *C. paniculatus* has been throughout history. These texts advocate it for improving brain functioning, easing neurological problems, and boosting overall health. In Unani medicine, Jyotishmati is recommended as a nerve tonic, aphrodisiac, and anti-inflammatory agent, whilst in Siddha traditions, it is considered a restorative substance for both the body and mind (Younus, 2015). Folk and tribal medicine document its employment in the treatment of rheumatism, dermatological conditions, and as a prophylactic measure against snake bites, illustrating its varied ethnomedicinal uses.

In addition to its traditional applications, contemporary scientific research has elucidated the pharmacological significance of *C. paniculatus*. Seeds and seed oil contain a lot of bioactive chemicals, like alkaloids, sesquiterpenes, triterpenoids, sterols, and fatty acids, which provide them a wide range of possible medical uses (Choudhary & Soni, 2021). Pharmacological research has substantiated the antioxidant, anti-inflammatory, neuroprotective, anti-arthritis, hepatoprotective, anxiolytic, and memory-enhancing attributes, corroborating numerous ancient assertions linked to this species. Notably, extracts and oil formulations have exhibited acetylcholinesterase inhibitory action, a mechanism directly pertinent to the treatment of Alzheimer's disease and other cognitive deficits (Bhanumathy et al., 2010).

The increasing prevalence of neurodegenerative illnesses, such as Alzheimer's disease, dementia, and Parkinson's disease, has rekindled interest in medicinal plants that possess cognitive-enhancing and neuroprotective attributes. In this regard, *C. paniculatus* has arisen as a viable option for herbal pharmacology and drug discovery. It is an appealing natural resource for making nootropic supplements and phytopharmaceuticals since it can help with learning and memory, lower oxidative stress, and protect neurons from excitotoxic and ischemia damage.

C. paniculatus is also important in the current wellness and nutraceutical markets, where there is a growing global demand for safe, plant-based alternatives to synthetic nootropics. As overharvesting and habitat damage put wild populations at risk, conservation and biotechnology research are becoming

more and more vital. Improvements in tissue culture and phytochemical standardization make it possible to use its medical properties in a sustainable way while making sure that commercial products are safe and of high quality.

Celastrus paniculatus exemplifies an extraordinary synthesis of traditional wisdom and contemporary research. This plant highlights the lasting importance of ethnobotanical wisdom in solving present-day healthcare concerns, from its deep-rooted involvement in ancient healing systems to its gaining acknowledgment in contemporary neuropharmacology. In the following sections, we will look at its botany, phytochemistry, pharmacological activity, medicinal prospects, and conservation measures in depth to show how important it is in many different ways.

II. DESCRIPTION AND DISTRIBUTION OF PLANTS

Celastrus paniculatus Willd. is a huge woody climbing shrub that belongs to the family Celastraceae. It is scientifically categorized as a member of the kingdom Plantae, order Celastrales, and genus *Celastrus* (Bairwa & Gautam, 2023). It usually grows to be 10 to 15 meters tall and wraps around other plants for support. Its strong, angular, corky stems make it easy to spot in the field (Mohan et al., 2010). The plant has smooth, elliptical to ovate leaves with a serrated edge. The leaves are bright green when they are young, but they turn a little yellowish as they get older. The flowers are small and hard to see, but they are greenish-yellow and grow in axillary or terminal panicles. This makes for a lot of blooms throughout the flowering season, which usually lasts from March to May. After fertilization, the flowers turn into round to oval capsules that are bright yellow to orange when they are ready to be picked. These capsules open up to show shiny black seeds that are covered in a fleshy, bright red aril. This feature helps birds spread the seeds and makes them look more attractive. The seeds are the most important portion for medicine. They make the well-known Jyotishmati oil, which is a pale yellow to brown, thick, and fragrant oil that has many health benefits. It is usually made by cold pressing or using solvents (Shinde et al., 2022; Dwivedi & Maurya, 2018). Folk medicine sometimes uses the bark and leaves of the root, although they haven't been investigated as much as the seeds. *C. paniculatus* is found all over the Indian subcontinent, where it grows best in the Himalayan foothills, the Western Ghats, central and eastern forests, and the dry areas of Rajasthan and Madhya Pradesh. Its natural range also includes Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, and other parts of Southeast Asia. It does well in tropical and subtropical regions, especially in dry deciduous woods, scrublands, and rocky slopes, usually at elevations of 300 to 1200 meters. The plant is very adaptable to several types of soil, from lateritic to sandy loams. However, it grows best in well-drained, fertile soils with moderate rainfall. Even though natural populations are tough, they are under a lot of stress because of overharvesting, habitat destruction, and low seed germination rates. This shows how important conservation efforts, ex-situ cultivation, and tissue culture methods are to make sure that these plants are always available for medicinal and commercial use.

III. TRADITIONAL AND ETHNOMEDICINAL USES

Celastrus paniculatus has been a big part of South Asian ethnomedicine for a long time. In Ayurveda, it is called "Jyotishmati" because it is said to be able to make the mind clearer and the memory sharper (Chintha et al., 2018). Ayurvedic texts categorize it as a medhya rasayana, a type of rejuvenating treatment that is specifically designed to improve cognitive health. It is used to treat conditions like apasmara (epilepsy), unmada (insanity or mental imbalance), and vatavyadhi (neurological and musculoskeletal disorders caused by deranged vata dosha) (Debnath et al., 2012). People often give the seeds and oil to help with memory, focus, and clear thinking. This is especially true for students, academics, and people whose memory is getting worse as they become older. Unani medicine uses Jyotishmati as a nerve tonic and aphrodisiac. It is thought to boost sexual energy, improve the neurological system, and ease inflammatory diseases like joint pain and chronic swelling. In addition to the formal medical systems, tribal and folk communities in India and Nepal have used the plant in many ways for a long time. For example, oil is rubbed into the skin to ease arthritis, rheumatism, and skin infections, and seed paste or decoctions are used to treat snakebites, boost digestion, and generally make people feel better. Traditionally, people take the oil orally in small, controlled amounts to help them study, boost their appetite, help them digest food, and boost their general energy. When applied to the skin, it is claimed to increase circulation and reduce muscle weariness. Some tribal communities have also been known to use the seeds in rituals. They think the seeds are sacred and give them energy, and they occasionally blend them into drinks that people drink during seasonal festivities to keep their minds from getting tired. Traditional healers used seed oil to treat paralysis, hysteria, anxiety, and nervous exhaustion, and leaf and bark preparations were sometimes used as extra treatments for skin eruptions, ulcers, and feverish conditions. They knew that it had more therapeutic uses than just being a nootropic and tonic. The various ethnomedicinal applications of *C. paniculatus* underscore its pivotal function as both a cognitive enhancer and a versatile therapeutic agent, connecting spiritual, cultural, and medicinal traditions throughout history.

IV. THE PHYTOCHEMISTRY OF *CELASTRUS PANICULATUS*

Research on the phytochemicals in *Celastrus paniculatus* has shown that it has a wide range of secondary metabolites, which mostly explain the wide range of pharmacological effects that this plant has. Seeds, seed oil, bark, leaves, and roots have been examined, revealing that the seeds and oil are the most abundant sources of bioactive chemicals. These components are part of various significant groups, such as alkaloids, sesquiterpene alkaloids, triterpenoids, flavonoids, fatty acids, sterols, polyalcohols, and phenolic compounds. Many of these groups are vital for protecting the nervous system, fighting inflammation, and protecting against free radicals (Nagpal et al., 2022). Bioactive compounds of *Celastrus paniculatus* are depicted in Figure no. 1.

4.1 Alkaloids

Alkaloids are what make *C. paniculatus* stand out, and the seeds have a lot of them. Celastrine, celapanine, paniculatine, and celapanigine are some of the most important alkaloids that have been separated. These alkaloids are known to have a strong effect on acetylcholinesterase, which improves cholinergic transmission and memory functions (Mukherjee et al., 2007). Experimental investigations indicate their involvement in neurotransmitter control, particularly in the modulation of dopamine and serotonin pathways, potentially elucidating the plant's anxiolytic and depressive properties (Sankaramourthy et al., 2022).

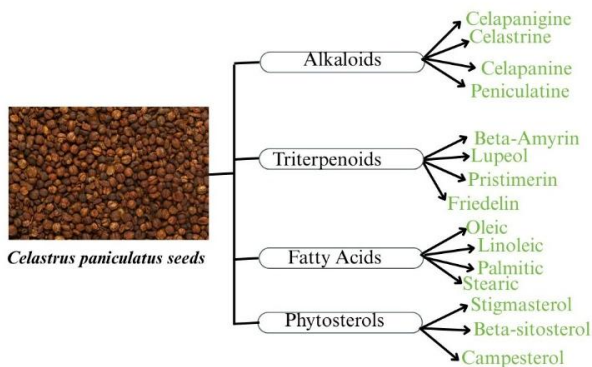


Figure 1: Bioactive compounds of *Celastrus paniculatus*

4.2 Sesquiterpene Alkaloids and Sesquiterpenes

This plant has many sesquiterpene alkaloids and sesquiterpenes that are not found in any other plants. These include paniculatine A, paniculatine B, and malkangunin. These chemicals demonstrate significant neuroprotective, anti-inflammatory, and cytoprotective properties, and have been evidenced to diminish glutamate-induced excitotoxicity in neuronal models. The unique chemical structure of these sesquiterpenes has garnered interest in natural product drug discovery, with possible implications for the development of innovative therapies for neurodegenerative disorders (Tu et al., 1993).

4.3 Triterpenoids

Seeds and other sections of plants have been shown to contain several triterpenoids, including β -amyrin, lupeol, pristimerin, and friedelin. Triterpenoids are well-known for their anti-inflammatory, pain-relieving, liver-protecting, and cancer-fighting effects (Camargo et al., 2022). Pristimerin has attracted pharmaceutical interest due to its apoptosis-inducing and anti-proliferative actions on several cancer cell lines, whilst lupeol is acknowledged for its antioxidant and membrane-stabilizing activities.

4.4 Fatty Acids and Components of Seed Oil

The seed oil of *C. paniculatus*, commonly referred to as Jyotishmati oil, possesses a diverse composition of unsaturated and saturated fatty acids. Oleic acid, linoleic acid, palmitic acid, and stearic acid are the main fatty acids. Arachidic and lignoceric acids are also present in small amounts. These fatty acids not only make the oil more nutritious, but they also make membranes more fluid, help

neurons send signals, and protect against free radicals. Linoleic and oleic acids, for example, are the building blocks of essential chemicals that help cells communicate and have been shown to be good for brain health and heart health (Das, 2006).

4.5 Sterols and polyalcohols

Phytosterols including β -sitosterol, stigmasterol, and campesterol are found in seeds and seed oil. They are structurally similar to cholesterol. These substances assist control lipid metabolism, lower inflammation, and change how the immune system works. Phytosterols have also been connected to changes in the neuroendocrine system, which may help the plant's reputation as an aphrodisiac and nerve tonic. Also, polyalcohols and phenolic chemicals help it fight free radicals and act as an antioxidant (Aleem, 2021).

4.6 Compounds of Phenolic and Flavonoid

Flavonoids and polyphenols extracted from *C. paniculatus*, despite being present in lesser quantities than alkaloids and triterpenes, have significant antioxidant properties, safeguarding neural cells from oxidative stress and DNA damage (Moola et al., 2020). These chemicals work with alkaloids to lower lipid peroxidation and boost the activity of antioxidant enzymes like superoxide dismutase and catalase.

V. ACTIVITIES OF DRUGS

The pharmacological profile of *Celastrus paniculatus* is exceptionally diversified, indicative of the extensive array of phytoconstituents found in its seeds, oil, and various plant parts. Preclinical investigations, in vivo models, and in vitro assays have all shown that traditional claims are becoming more and more true. Together, these research show that it could be useful in neuropharmacology, inflammation, oxidative stress management, metabolic diseases, and reproductive health. The following subsections give a brief overview of the main things the plant did. The pharmacological activities of *Celastrus paniculatus* are depicted in Figure 2.

5.1 Effects on the Nervous System

One of the most well-known and historically important uses of *C. paniculatus* is to protect the brain and improve cognitive function. Numerous research have illustrated its nootropic, anxiolytic, and neuroprotective properties.

Cognition and memory: Animal models, such as rats and mice, administered with seed oil or alcoholic extracts have enhanced learning capabilities, memory retention, and recall performance in maze and passive avoidance assessments. The increase in acetylcholine turnover in the cortex and hippocampus is thought to be the main way this happens (Zakka, 2016).

Anti-Alzheimer's activity: Oil and extracts show that they inhibit acetylcholinesterase (AChE), which raises acetylcholine levels in synaptic clefts. Also, they lower the amount of amyloid- β plaque that builds up and increase the levels of antioxidants that are already in the body. This makes

them look good for Alzheimer's and dementia (V & Jaideep, 2020).

Neuroprotection: Extracts safeguard neurons against oxidative stress, ischemia-reperfusion injury, hypoxia, and degeneration generated by neurotoxins (e.g., glutamate toxicity). This has been ascribed to the increased activity of enzymes such as

superoxide dismutase, catalase, and glutathione peroxidase, along with less lipid peroxidation (Godkar et al., 2005).

Behavioral effects: The use of Jyotishmati oil has been associated with less anxiety-like behavior, antidepressant effects, and enhanced motor coordination, indicating possible efficacy in mood and movement disorders (Veena et al., 2021).

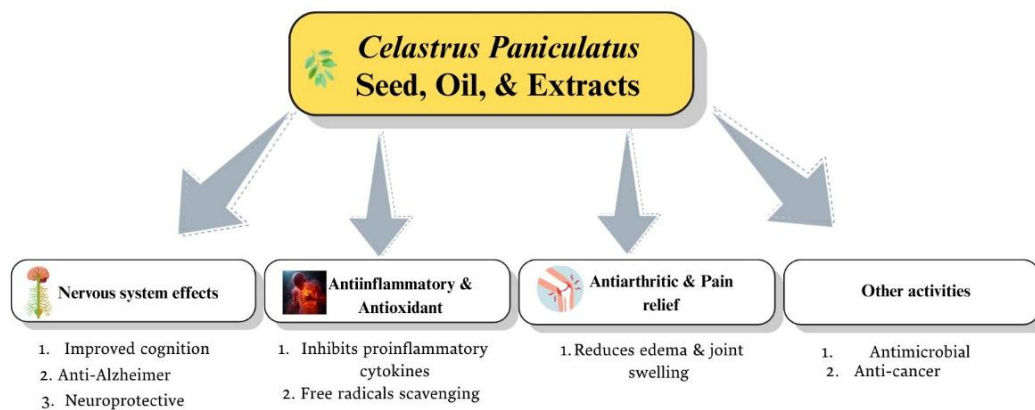


Figure 2: Major health-promoting effects of *Celastrus paniculatus*

5.2 Activities that fight inflammation and free radicals

Free radical scavenging: Extracts have significant antioxidant properties that protect DNA and lipids from oxidative damage by neutralizing reactive oxygen species (ROS) (Kumar & Gupta, 2002).

Seed oil modulates enzymes by raising the amounts of natural antioxidant enzymes including catalase, superoxide dismutase, and glutathione peroxidase, while also lowering malondialdehyde (MDA), which is a sign of lipid peroxidation.

Anti-inflammatory pathways: Both in vitro and in vivo models demonstrate the suppression of pro-inflammatory cytokines (TNF- α , IL-6, IL-1 β) and the inhibition of mediators such as nitric oxide and cyclooxygenase-2 (COX-2). These activities make the herb helpful for inflammatory diseases, arthritis, and inflammation of the nerves.

5.3 Effects on arthritis and pain relief

Modern study has confirmed that Jyotishmati oil has been used for a long time to treat arthritis and joint pain. In animal models of arthritis, the injection of seed oil greatly diminishes paw edema, joint swelling, and synovial inflammation. Extracts stop pro-inflammatory mediators in the joints, which lessens pain and stiffness. The anti-inflammatory and pain-relieving effects of *C. paniculatus* imply that it could help with rheumatoid arthritis, osteoarthritis, and chronic musculoskeletal pain syndromes (Venkatesha et al., 2012).

5.6 Other Pharmacological Activities

Antimicrobial activity: Extracts limit the growth of both Gram-positive and Gram-negative bacteria and fungi, which

suggests they could be used to treat skin infections and wounds.

Wound healing: Putting seed oil on the skin speeds up wound contraction, epithelialization, and collagen deposition.

Anxiolytic and adaptogenic effects: Extracts mitigate stress-induced biochemical alterations and behavioral anomalies, hence validating its categorization as a medhya rasayana and adaptogen.

Metabolic effects: Preliminary investigations indicate potential antidiabetic and hypolipidemic benefits, however these require further investigation.

Anticancer potential: Some triterpenoids and alkaloids derived from the plant exhibit cytotoxic effects against cancer cell lines, necessitating additional investigation.

VI. BIOTECHNOLOGICAL AND PHARMACOLOGICAL POSSIBILITIES

Celastrus paniculatus has become very popular in recent years because of its potential use in treating neurodegenerative diseases like Alzheimer's, Parkinson's, and different types of dementia. This is because current synthetic drugs often only help with symptoms and have side effects that people don't want. Alkaloids and sesquiterpenes that inhibit acetylcholinesterase, have antioxidant properties, and protect neurons from oxidative stress show that this plant is a good source of nootropic phytoconstituents that could help restore neurotransmitter balance, protect neuronal structures from oxidative stress, and improve memory and cognitive performance (Godkar et al., 2005). Modern research is focused on creating new phytopharmaceutical formulations,

such as capsules, emulsions, soft gels, and standardized oil-based nutraceutical supplements. These are meant to improve bioavailability, make sure that doses are consistent, and meet regulatory quality standards (Aleem, 2021). Researchers are also looking into nanotechnology-based delivery systems such as nanoemulsions, liposomes, and polymeric nanoparticles to improve the solubility, stability, and targeted distribution of Jyotishmati seed oil constituents. This could lead to novel clinical uses. In terms of conservation and production, tissue culture methods like callus culture, organogenesis, and in vitro propagation offer long-term ways to grow the species, keep its genes stable, and boost the production of secondary metabolites that would be hard to get otherwise because of low seed germination and overharvesting of wild populations. Biotechnological interventions, including elicitor treatments, metabolic engineering, and hairy root cultures, could further enhance the yield of bioactive alkaloids and terpenoids, rendering large-scale production viable for industrial applications (Anusha et al., 2016). Another important possibility is the synergistic use of *C. paniculatus* with other well-known herbal nootropics like *Bacopa monnieri* (Brahmi) and *Withania somnifera* (Ashwagandha). When these herbs are combined, they may work together in different ways, such as by regulating acetylcholine and GABA, protecting against oxidative stress, and adapting to stress, which could make them more effective at improving learning, memory, and stress resilience. Incorporating *C. paniculatus* into polyherbal formulations, a well-established practice in Ayurveda, not only validates traditional knowledge but also presents opportunities for global nutraceutical markets seeking safe, effective, and evidence-based herbal cognitive enhancers. When you put all of these pharmacological and biotechnological advances together, they show that *C. paniculatus* is a multi-dimensional plant resource that connects ancient medicinal knowledge with modern therapeutic innovation. This means that more research is needed through clinical trials, standardization protocols, and regulatory frameworks to fully realize its neuropharmacological potential.

VII. SAFETY, TOXICITY, AND REGULATORY STATUS

Historically, *Celastrus paniculatus* has been considered a safe and well-tolerated medicinal plant when utilized in prescribed dosages, as evidenced in classical Ayurvedic and Unani literature, where its seed oil and formulations are ingested for extended durations as a medhya rasayana, without indications of severe toxicity (Mishra et al., 2020). Contemporary toxicological evaluations indicate that moderate doses of seed oil or extracts yield no significant adverse effects; however, excessive or unregulated consumption may lead to symptoms including gastrointestinal irritation, abdominal cramps, nausea, diarrhea, and a burning sensation in the stomach, likely attributable to its high bioactive alkaloid and fatty acid content. High doses may also produce depression of the central nervous system (CNS), which can make you feel dizzy, tired, or sleepy (Bhanumathy, Chandrasekar, et al., 2010). In rare situations, it can also cause low blood pressure and bradycardia. Animal studies suggest a

considerable safety margin, as no fatalities were recorded at therapeutic-equivalent doses; however, research on chronic exposure and reproductive toxicity is yet insufficient. The seed oil should be avoided during pregnancy and lactation, as its safety profile for fetal and neonatal development has not been established. From a regulatory point of view, *C. paniculatus* is mostly sold as Ayurvedic products, herbal oils, and supplements that help with memory. However, major global agencies like the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA) have not yet approved it as a standardized phytopharmaceutical. The Ayush pharmacopoeia in India recognizes it, but quality control is still a problem because the content of seed oil varies, it can be mixed with other substances, and there are no standard extraction methods. For broader regulatory approval and clinical adoption, there is an urgent requirement for extensive toxicological profiling, pharmacokinetic analyses, dose-response assessments, and meticulously structured clinical trials to validate its efficacy and safety in human subjects. Moreover, the global marketing of Jyotishmati oil and extracts as nootropic nutraceuticals necessitates compliance with Good Manufacturing Practices (GMP), safety labeling, and emerging international phytomedicine standards. So, even though *C. paniculatus* is still thought to be safe in traditional medicine, its long-term adoption by doctors and regulators will depend on strong scientific proof and safety rules that are the same for everyone. People have always thought it was safe to take in the right amounts. Taking a lot of oil can make you sick, upset your stomach, or lower your CNS. For regulatory clearances, more systematic research of toxicology, clinical trials, and pharmacokinetics are needed.

VIII. FUTURE OPPORTUNITIES AND RESEARCH PATHWAYS

Despite its long history of traditional use and growing pharmacological evidence, there are still many things about *Celastrus paniculatus* that haven't been studied enough. This shows that more systematic research and development is needed to properly understand its therapeutic potential. One of the most promising areas is molecular and mechanistic research that try to figure out exactly what biochemical and cellular pathways are responsible for its neuroprotective and nootropic effects. Studies that use genomic, transcriptomic, and proteomic methods could find important molecular targets, like enzymes, receptors, and signaling pathways that help with memory improvement, reducing neuroinflammation, and lowering oxidative stress. These kinds of studies would not only back up old claims, but they would also help us make synthetic analogs or standardized herbal formulations that are sure to work.

Another important issue is making sure that seed oils and extracts are the same so that their pharmacological activity and safety are always the same. Because the chemical makeup of pharmaceutical-grade preparations can change depending on where they are made, the weather, and the time of year, it is important to create quality control methods, marker-based standardization, and Good Manufacturing Practice (GMP) requirements. In addition, strict clinical trials are necessary to prove that drugs are safe and effective in people, especially for

neurological diseases including Alzheimer's disease, cognitive decline, anxiety, and depression. Controlled research on dosage, formulation, bioavailability, and long-term safety will yield the requisite proof for regulatory approval and integration into conventional therapies.

It is just as crucial to protect and use *C. paniculatus* in a way that doesn't harm it. Overharvesting from wild populations and the degradation of their habitats have made the species more and more vulnerable. To stop genetic erosion and make sure there is a steady supply for both medicinal and commercial use, we need in-situ and ex-situ conservation techniques right away. These include cultivation programs, seed banks, tissue culture propagation, and habitat restoration. Biotechnology methods including callus culture, hairy root induction, and metabolite augmentation can help keep wild genetic diversity while supporting sustainable production.

Finally, innovative delivery technologies, such as formulations based on nanotechnology, are a promising way to improve the bioavailability and targeted delivery of active compounds in *C. paniculatus*. Nanoemulsions, liposomes, and polymeric nanoparticles have the potential to enhance the solubility, stability, and controlled release of essential alkaloids and terpenoids, hence increasing their efficacy in traversing the blood-brain barrier and providing neuroprotective effects. When combined with pharmacokinetic and pharmacodynamic investigations, these new ideas could turn old medicines into new, scientifically proven treatments.

IX. CONCLUSION

In conclusion, *Celastrus paniculatus* exemplifies a significant intersection of old knowledge and modern scientific research, highlighting the persistent importance of traditional medicinal plants in contemporary healthcare. This species has long been known for its cognitive-enhancing, neuroprotective, and rejuvenating effects. It has a long history as a medhya rasayana in Ayurveda and similar usage in Unani, Siddha, and folk medicine. Recent pharmacological research has started to confirm these assertions, showing its antioxidant, anti-inflammatory, hepatoprotective, anti-arthritic, anxiolytic, and memory-enhancing properties, mainly due to its various bioactive compounds, such as alkaloids, sesquiterpenes, triterpenoids, fatty acids, and sterols.

C. paniculatus has the potential to be used as a natural nootropic and neuroprotective drug, as well as a source for new phytopharmaceuticals, nutraceuticals, and functional foods that target neurological and cognitive problems. Combining molecular pharmacology, clinical validation, standardized extraction methods, and advanced drug delivery systems could make it possible to make safe, effective, and reproducible formulations for Alzheimer's disease, dementia, anxiety, depression, and other neurodegenerative disorders. Biotechnological methods like tissue culture, callus induction, and metabolite augmentation also help with sustainable farming and conservation, which lowers the chance of overharvesting from wild populations.

In addition to its therapeutic uses, *C. paniculatus* is a good example of how to use traditional knowledge and modern science together in ethnopharmacological research. Its examination may elucidate mechanistic insights into neuroprotection, antioxidative defense, and cognitive enhancement, hence enhancing the comprehensive understanding of plant-derived neuroactive chemicals. By encouraging collaboration between ethnobotanists, pharmacologists, chemists, and clinicians, the entire medicinal potential of this "Intellect Tree" can be realized, assuring its preservation, sustainable usage, and incorporation into modern healthcare systems.

Celastrus paniculatus is not just a historical medicinal plant; it is a promising natural resource that could have a big effect on cognitive health, mental health, and the treatment of neurological diseases in the 21st century. This shows how traditional knowledge and modern technology can work together to create something new.

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