A COMPREHENSIVE STUDY AND PHYSICO-CHEMICAL ANALYSIS OF *CELASTRUS PANICULATUS* SEED OIL

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Abstract

Ayurvedic medicine makes extensive use of Celastrus paniculatus, sometimes referred to as the "Intellect Tree," due to its neuroprotective, anti-inflammatory, and antioxidant qualities. Analyzing Celastrus paniculatus seed oil's phytochemical makeup, physicochemical characteristics, and biological potential is the goal of this study. Following extraction and phytochemical analysis, the oil's medicinal properties were attributed to the presence of alkaloids, flavonoids, steroids, terpenoids, cardiac glycosides, and saponin glycosides.

The stability and composition of the oil were evaluated by physicochemical analysis, which included the values of acid, saponification, iodine, ester, and hydroxyl. The GC-MS analysis identified various bioactive compounds, confirming its potential pharmacological significance. These findings support the traditional use of CPS oil in treating neurological disorders, inflammation, and oxidative stress-related conditions. Further studies are recommended to isolate and characterize specific bioactive constituents for targeted therapeutic applications.

The current study's objective was to analyze Celastrus paniculatus seeds pharmacologically and physicochemically. Celastraceae is the family. Pharmacognostic characteristics are used in this study as seed oil identification factors. The conventional process yielded 25% oil. According to the GC-MS study, the oil contains 109 different components. These compounds may be what give C. paniculatsus seed oil its medicinal properties. Additionally, physiochemical characteristics including TLC analysis, foreign organic matter, extractive values, and ash values were ascertained. The presence of alkaloids, flavonoids, tannins, sterols, and terpenoids was shown by preliminary phytochemical screening. The Celastrus paniculatus seed's phytochemical and physiochemical analysis aids in sample identification, quality, and purity standards.

Keywords: Pharmacognostic, Jyotishmati, Malkangani, *Celastrus paniculatus.*

Introduction

The highly prized medicinal plant Celastrus paniculatus, also known as the "Intellect Tree," has long been utilized in Ayurvedic remedy for a number of therapeutic applications. The plant is well-known for its wide range of pharmacological activities, which include antiviral, antibacterial, insecticidal, analgesic, anti-inflammatory, hypolipidemic, sedative, and anticonvulsant properties. It has also been used extensively in the treatment of rheumatism, neurological conditions, and cognitive impairments. One of its most valuable constituents is the seed oil, which is used to improve mental clarity, concentration, and general cognitive functions.

Furthermore, traditional medicine has utilized the plant's bark, leaves, blossoms, and seeds to treat skin conditions, inflammation, joint discomfort, and digestive problems. According to phytochemical research, Celastrus paniculatus contains bioactive substances that support

its therapeutic qualities, including sterols, alkaloids, flavonoids, triterpenoids, saponins, and glycosides. The plant's promise for treating neurodegenerative illnesses is explained by the bioactive substances it contains, which are essential for regulating neurotransmitter function, lowering oxidative stress, and shielding neuronal cells.
Celastrus paniculatus seeds were extracted in this study using a variety of organic solvents, including methanol, petroleum ether, acetone, and hexane. The resulting extracts were then screened for phytochemicals.

The investigation revealed the presence of triterpenoids, alkaloids, and sterols—three important chemicals that give the plant its therapeutic properties. Additionally, this study uses cutting-edge analytical methods including GC-MS to examine the phytochemical makeup, biological potential, and physicochemical characteristics of CPS oil. The results of this study will promote the plant's usage in contemporary medicine, especially in neuropharmacology and herbal medication development, and will scientifically validate its traditional applications.

A: The plant habit with young fruits. B: Flowering branchlets. C: Close-up of flowers. D: An Inflorescence with bracts. E: An Infructescence. F: Close-up of a capsule. G: Capsule with seeds.

Celastrus paniculatus - Medicinal Plant Information

Category	Details
Scientific Name	*Celastrus paniculatus* Willd.
Family	Celastraceae
Genus	*Celastrus*
Kingdom	Plantae
Order	Celastrales
Class	Angiospermae
Species	*Paniculatus*
Synonym	*Celastrus dependent*

Common Names in Different Languages

Language	Common Name
Hindi	Malkakni, Malkagni, Malkamni
English	Black-oil tree, Intellect tree, Climbing-staff plant
Malayalam	Polulavam
Gujarati	Malkangana
Sanskrit	Jyotishmati, Svarnalota, Sphutabandhani
Kannada	Kariganne
Marathi	Kangani, Malkangoni

Geographical Distribution

Region	Details
Himalayas	Found at an altitude of 1200m
India	South Gujarat, Central India
Other Countries	Sri Lanka, Burma, China

Botanical Description

Feature	Description
Plant Type	Large deciduous climber
Height	Can grow up to 18 meters
Bark	Pale brown, rough, with shallow cracks
Seeds	Dark brown, enclosed in an orange-red aril

Medicinal Uses

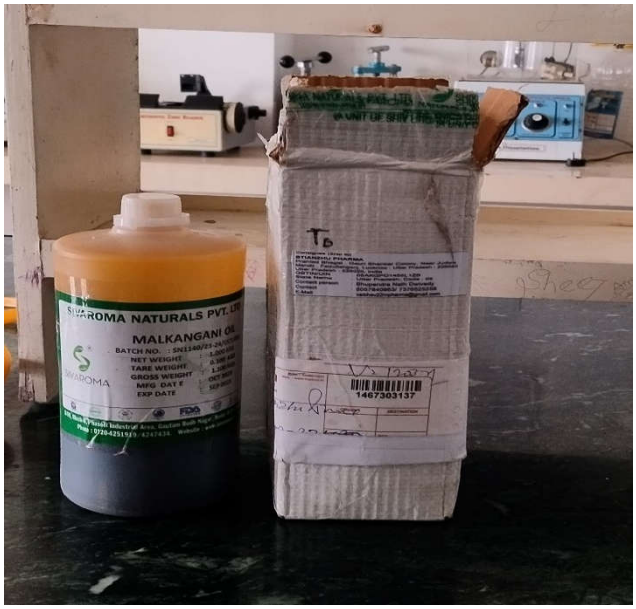
Plant Part	Medicinal Benefits
Bark	Abortifacient properties
Seeds	Appetizer, laxative, aphrodisiac, nerve stimulant, brain tonic, used in rheumatism
Seed Oil	Remedy for beriberi and rheumatism
Leaves	Antidote for opium poisoning
Flowers	Analgesic and anti-inflammatory properties

OBJECTIVES

1. Procurement of *Celastrus paniculatus* seed oil.
2. Phytochemical investigation and instrumental analysis of *CPS* oil.
3. Biological Evaluation.

1. Procurement of *Celastrus paniculatus* seed oil.

- The MALKANGANI OIL was purchased from “Sivaroma Naturals PVT LTD, Gautam Budh Nagar, Noida, UP 201305, India” on date 20-1-24.
- The drug was received with a certificate of analysis on 26-01-24.
- The color of the seed oil drug is reddish brown in color with a container.



2. Phytochemical screening of *Celastrus paniculatus* seed oil

Bioactive substances such as alkaloids, flavonoids, saponins, and terpenoids are to be identified and assessed using phytochemical screening of CPS oil. As a result, future studies on the oil's therapeutic uses are supported and its medical potential including its anti-inflammatory, neuroprotective, and antioxidant qualities is better understood.

(A) Physical properties of oil:

a) Organoleptic properties:

Colour: Colour was detected by visual inspection by naked eyes**.**

Odour: Odour was identified by sense organ i.e. inhaling by nasal route.

b) pH: The use of pH to designate the negative logarithm of hydronium ion concentration has proved. The concentration of all species involved in successive acid base equilibrium change with pH and can be represented solely in terms of equilibrium constant and the hydronium ion concentration. The pH of oil was determined by pH meter. The pH meter was calibrated using buffer solution of pH 7.4 and 9.2 and then pH of oil was seen.

c) Viscosity:

Viscosity is an expression of the resistance to flow of a system under an applied stress. Viscosity was determined by Brookfield viscometer**.**

(B) Analysis of Oil:

The various physical constants like acid value, acetyl value, saponification value, iodine value etc. were determined by using standard methods of Indian pharmacopoeia.

a. Acid value

Acid value is the number which expresses in milligrams the amount of potassium hydroxide necessary to neutralize the free acids present in 1g of the substance.

b. Saponification value

The Saponification value is the number of milligrams of potassium hydroxide necessary to neutralize the free acids and to saponify the esters present in1g of the substance.

c. Ester Value

The ester value, which measures a substance's ester content, is commonly used in the analysis of fats, oils, and waxes. In one gram of the sample, it shows how many milligrams of KOH are required to saponify the esters.

d. Hydroxyl Value

In milligrams, the hydroxyl value indicates how much KOH is needed to neutralize the acid produced by acylation in one gram of the material. This number aids in identifying the existence of free hydroxyl groups, which affect the oil's stability and reactivity.

e. Iodine Value

The level of unsaturation in oils and fats is indicated by the iodine value. It is stated as the quantity of iodine that 100 grams of the material will absorb under particular circumstances. More double bonds, which indicate more unsaturation, are suggested by a higher iodine value. When evaluating the oil's oxidative stability and drying characteristics, this metric is essential.

f. Specific Gravity

A dimensionless metric called specific gravity (SG), sometimes referred to as relative density, calculates a substance's density in relation to that of water at a specific temperature.

g. Solubility

One definition of "solubility" is the ability of a material (solute) to dissolve in a solvent and produce a homogenous solution. Celastrus paniculatus oil's solubility is influenced by temperature, pressure, and solvent type. Oils are frequently insoluble in water due to their hydrophobic properties, but soluble in non-polar solvents including ether, chloroform, and benzene.

h. Insolubility

The reverse of solubility, insolubility refers to a substance's incapacity to dissolve in a certain solvent. Oil from Celastrus paniculatus is more soluble in organic solvents like ethanol and hexane than in polar solvents.

i. Boiling Point

A material is the temperature at which its vapor pressure reaches the ambient air pressure and it changes from a liquid to a gas. Because Celastrus paniculatus oil contains fatty acids and other bioactive components, its boiling point varies according on its composition but usually falls between 250°C and 350°C. The precise boiling point may also be influenced by contaminants and atmospheric pressure.

3. **GC-MS-Based Quantitative Analysis of Phytochemicals**

GC-MS a potent method that blends gas-liquid chromatography (GC) with mass spectrometry (MS), is used to analyze essential oils. Both qualitative and quantitative examination are possible using this approach, which aids in identifying the different components of the oil and figuring out their relative concentrations. This examination allows for an accurate assessment of the oil's composition and purity.

Drug detection, forensic investigations, environmental analysis, explosives identification, and the characterization of unknown chemicals are just a few of the many domains that make extensive use of GC-MS. Furthermore, even when the original materials have significantly degraded, it may still identify trace components in complicated combinations.

Quantitative Analysis of Phytochemicals in *Celastrus paniculatus* Seed Oil by GC-MS

Instrument Used	GCMSMS
MS Type	QQQ
Version (Acq SW)	MassHunter GC/MS Acquisition 10.0.368
Method Path (Acq)	D:\MassHunter\GCMS\1\method\SCAN METHOD 20 MINUTES PESTICIDES.M
MS transfer linetemperature	300°C.
Ion source temperature	230°C
Position	4
Inj. Vol. (ul)	3
Flow Rate	1 ml/min
Carrier Gas	Helium
Column Used	Agilent DB 5MS (30-meter X 0.25 mm)

RESULTS AND DISCUSSION

Phytochemical Screening of *Celastrus paniculatus* seed oil.

The dynamic phytochemical groups identified by phytochemical screening assays for alcoholic extracts of CPS oil were flavonoids, phenols, reducing sugars, alkaloids, and cardiac glycosides, as shown in Table

SN	Parameters	Observation
1	Reducing sugar	+ve
2	Non reducing sugar	-ve
3	Proteins	+ve
4	Amino acids	+ve
5	Monosaccharides	+ve
6	Steroids	+ve
7	Flavonoids	+ve
8	Alkaloids	+ve
9	Tannins	-ve
10	Carbohydrate	+ve
11	Terpenoids	+ve
12	Volatile oil	-ve
13	Fixed oil	+ve
14	Phytosterols	+ve
15	Phenols	-ve
16	Diterpenoids	+ve
17	Cardiac glycosides	+ve
18	Anthraquinone glycosides	-ve
19	Cumarin glycosides	-ve
20	Saponin glycosides	+ve

Phytochemical Investigation results of *Celastrus paniculatus* seed oil

S. No.	Physicochemical Parameter	Specification	Results
1	Appearance	Reddish Brown Liquid	Complies
2	Odour	Characteristics	Unpleasant
3	Taste	-	Bitter
4	Touch		Smooth and Light
5	Specific Gravity	0.890-0.930	0.924
6	Refractive Index	1.460-1.490	1.476
7	Acid Valve	NMT 25.0 (mgKOH/g)	5.61
8	Iodine Value	90-120 (gl_2/100g)	106.4
9	Saponification Value	180-210 (mgKOH/g)	195.8
10	Mineral Oil	-	Absent
11	Peroxide Value	-	0.5
12	pH	-	7 – 7.1
13	Viscosity	-	16.6 - 20.8 cSt (Centistokes)
14	Boiling Point	-	220-221°C

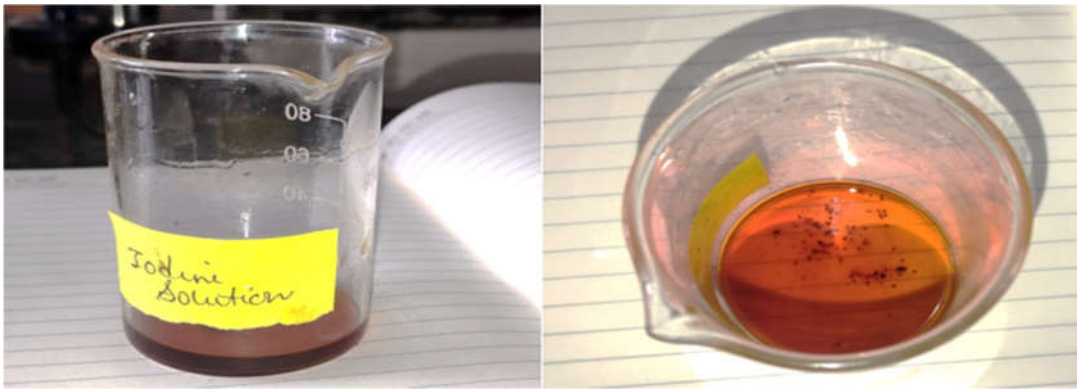
S. N	Solubility	Soluble
1	Freely	Ethylacetate, Chloroform, and Ether
2	Less	Benzene and ethanal
3	No Solubility	Methanol.

Solubility

Boiling Point

Specific Gravity

Iodine Value



Saponification Value

Acid Value

GC-MS Analysis

While the Mass Spectrometry (MS) graph shows the proportion of each component present, the Gas Chromatography (GC) graph gives the oil's precise composition. The oil sample contains a complex variety of bioactive chemicals, as shown by the 109 peaks in the gas chromatogram. The oil's purity and possible therapeutic benefits are determined by this analysis, which makes it useful for pharmaceutical and medical purposes.

Analysis Report

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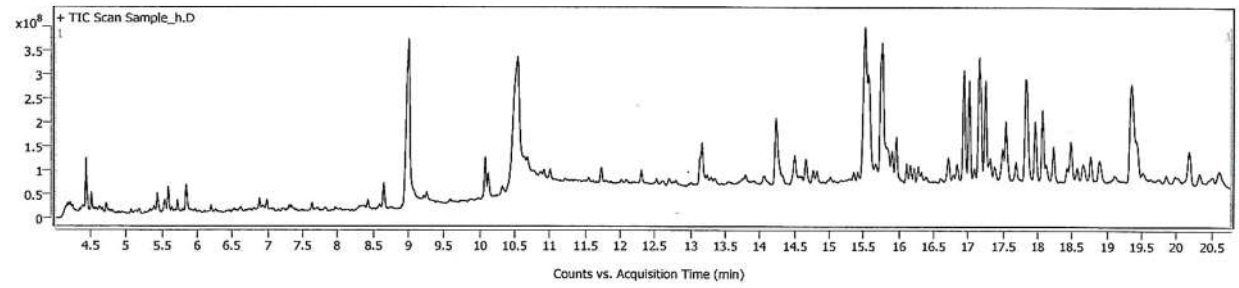
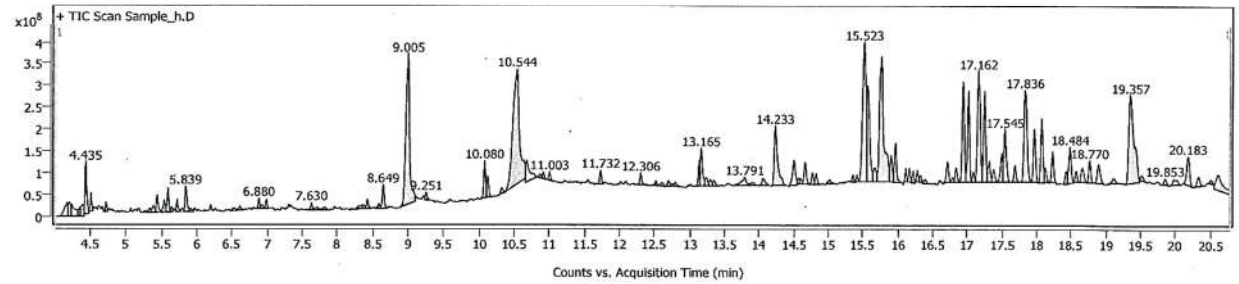
Sample Information

Name	Sample_h	**Data File Path**	D:\MassHunter\GCMS\1\data\2024\Result\February_2024\29022024_scan\Sample_h.D
Sample ID		**Acq. Time (Local)**	29-02-2024 13:50:42 (UTC+05:30)
Instrument	GCMSMS	**Method Path (Acq)**	D:\MassHunter\GCMS\1\methods\SCAN METHOD 20 MINUTES PESTICIDES.M
MS Type	QQQ	**Version (Acq SW)**	MassHunter GC/MS Acquisition 10.0.368 14-Feb-2019 Copyright © 1989-2018 Agilent Technologies, Inc.
Inj. Vol. (ul)	3	**IRM Status**	
Position	4	**Method Path (DA)**	D:\MassHunter\GCMS\1\data\2024\Result\February_2024\29022024_scan\Sample_h.D\Results \Qual\Version4\default.m
Plate Pos.		**Target Source Path**	D:\MassHunter\Library\NIST17.L
Operator		**Result Summary**	109 found

Sample Chromatograms





Chromatogram Peaks

Peak	Start	RT	End	Height	Area	Area %	SNR
1	4.042	4.180	4.191	31751758	110944922	6.50	
2	4.191	4.213	4.237	32691360	78613374	4.60	
3	4.237	4.249	4.328	26806560	99815069	5.85	
4	4.328	4.346	4.356	19913576	29845441	1.75	
5	4.356	4.395	4.412	27270726	79374716	4.65	
6	4.412	4.435	4.481	117512917	201511561	11.80	
7	4.481	4.508	4.534	40528290	58868210	3.45	
8	4.687	4.716	4.745	19225757	30807410	1.80	
9	5.278	5.337	5.352	9457845	23095178	1.35	
10	5.352	5.389	5.412	15425465	36645766	2.15	
11	5.412	5.437	5.490	38744105	77489034	4.54	
12	5.490	5.538	5.562	27853485	58108262	3.40	
13	5.562	5.591	5.624	53902519	96365005	5.64	
14	5.624	5.643	5.663	12938869	20668566	1.21	
15	5.696	5.718	5.770	25720294	46494802	2.72	
16	5.813	5.839	5.890	57317817	118829284	6.96	
17	5.890	5.905	5.947	7403233	17842742	1.04	
18	6.482	6.524	6.572	6346100	19186510	1.12	
19	6.572	6.615	6.650	8543972	18986025	1.11	
20	6.849	6.880	6.902	22339498	32302113	1.89	
21	6.902	6.922	6.959	7815162	18263348	1.07	
22	6.959	6.988	7.016	19936044	31142049	1.82	
23	7.579	7.630	7.655	16037783	28134338	1.65	
24	7.655	7.709	7.776	6608855	25729105	1.51	
25	7.776	7.817	7.865	6551270	17958875	1.05	
26	8.256	8.346	8.356	8115698	31430980	1.84	
27	8.356	8.376	8.400	8746007	18536133	1.09	
28	8.400	8.427	8.481	19725345	38508570	2.26	
29	8.538	8.592	8.612	10155523	20376605	1.19	
30	8.612	8.649	8.708	53003177	103682497	6.07	
31	8.892	9.005	9.098	341931864	1294276497	75.80	
32	9.229	9.251	9.299	16337446	28971329	1.70	
33	10.039	10.080	10.103	84620491	148849717	8.72	

Analysis Report

Agilent | Trusted Answers

Chromatogram Peaks

Peak	Start	RT	End	Height	Area	Area %	SNR
34	10.103	10.122	10.179	47313659	88041552	5.16	
35	10.297	10.325	10.366	13071721	27610211	1.62	
36	10.379	10.544	10.660	262375234	1707568891	100.00	
37	10.660	10.678	10.823	48575883	196206132	11.49	
38	10.834	10.871	10.892	8311259	18083613	1.06	
39	10.892	10.912	10.947	14340928	23846721	1.40	
40	10.967	11.003	11.036	18641219	32239327	1.89	
41	11.699	11.732	11.763	30652458	56738044	3.32	
42	12.257	12.306	12.393	26199525	52934218	3.10	
43	12.467	12.519	12.555	10050625	20134340	1.18	
44	12.555	12.610	12.644	7001960	19426778	1.14	
45	12.669	12.699	12.736	12187320	28241517	1.65	
46	12.768	12.792	12.862	8866964	22929390	1.34	
47	13.094	13.138	13.145	57083323	78921043	4.62	
48	13.145	13.165	13.217	84832055	200251881	11.73	
49	13.217	13.241	13.269	19210264	45094602	2.64	
50	13.269	13.296	13.327	14482408	37006043	2.17	
51	13.327	13.347	13.411	11826299	30988630	1.81	
52	13.668	13.791	13.853	18189998	89903465	5.26	
53	13.853	13.892	13.974	6105529	26104456	1.53	
54	14.009	14.056	14.135	15442946	53381418	3.13	
55	14.189	14.233	14.384	134823269	495232439	29.00	
56	14.437	14.504	14.554	57428160	183187005	10.73	
57	14.554	14.576	14.593	12970302	25287552	1.48	
58	14.593	14.610	14.632	12010949	20975511	1.23	
59	14.632	14.666	14.724	47957560	111347155	6.52	
60	14.738	14.771	14.800	25550945	53525181	3.13	
61	14.800	14.823	14.886	23938960	54416920	3.19	
62	14.964	15.018	15.057	9862153	23353702	1.37	
63	15.330	15.355	15.383	15330867	26335616	1.54	
64	15.392	15.415	15.444	15092123	25951994	1.52	
65	15.444	15.523	15.555	318366259	1132641308	66.33	
66	15.555	15.568	15.641	219738355	625760264	36.65	
67	15.641	15.671	15.706	32197771	101491537	5.94	
68	15.706	15.772	15.881	284523571	1250968177	73.26	
69	15.881	15.908	15.937	59418819	133014585	7.79	
70	15.937	15.969	16.031	86912703	200894054	11.76	
71	16.095	16.120	16.142	29553531	43906598	2.57	
72	16.142	16.169	16.197	30055915	52195972	3.06	
73	16.197	16.223	16.248	26535611	44331056	2.60	
74	16.257	16.282	16.305	26397659	43362083	2.54	
75	16.305	16.327	16.355	15220150	28477756	1.67	
76	16.359	16.393	16.440	9741342	24922302	1.46	
77	16.671	16.716	16.754	46085947	105183010	6.16	
78	16.754	16.783	16.805	10970371	21039848	1.23	
79	16.805	16.835	16.884	33285847	73327839	4.29	
80	16.887	16.939	16.980	228276094	515079973	30.16	
81	16.980	17.015	17.057	203942648	427275397	25.02	
82	17.057	17.087	17.116	23559942	47791019	2.80	
83	17.116	17.162	17.214	252194217	750759943	43.97	
84	17.214	17.251	17.289	207271995	458443147	26.85	
85	17.289	17.316	17.351	44848616	110410761	6.47	
86	17.351	17.382	17.436	28095246	68102564	3.99	
87	17.436	17.501	17.518	63853218	150252656	8.80	
88	17.518	17.545	17.607	118231818	290640003	17.02	
89	17.643	17.688	17.756	36744372	83207179	4.87	
90	17.786	17.836	17.922	209579091	662069503	38.77	
91	17.922	17.965	18.017	122050006	286971558	16.81	
92	18.026	18.073	18.107	145823581	322545549	18.89	
93	18.107	18.125	18.175	33090211	73087280	4.28	
94	18.186	18.228	18.276	68258827	151448558	8.87	
95	18.387	18.428	18.447	29679000	62762830	3.68	
96	18.447	18.484	18.536	82042656	217363679	12.73	
97	18.536	18.574	18.610	24806495	50629276	2.96	
98	18.621	18.662	18.724	31736384	95297154	5.58	
99	18.724	18.770	18.812	49359779	111418881	6.53	
100	18.848	18.897	18.977	42775659	139360446	8.16	
101	19.047	19.115	19.183	11706399	40459143	2.37	
102	19.289	19.357	19.486	200377543	1036180962	60.68	
103	19.486	19.522	19.565	11570629	31447316	1.84	
104	19.813	19.853	19.912	13592967	36305213	2.13	
105	19.936	19.983	20.073	12631881	58713600	3.44	
106	20.116	20.183	20.240	64563975	196563403	11.51	
107	20.274	20.334	20.425	21452614	67562280	3.96	
108	20.476	20.521	20.550	8610432	20287262	1.19	
109	20.555	20.617	20.783	34937962	249224175	14.60	

Compound Summary

Cpd	Name	Formula	RT	Mass	CAS	ID Source	Score	Score (Lib)	Score (DB)	Score (MFG)	Algorithm
1	Z,Z-2,5-Pentadecadien-1-ol	C15 H28 O	4.180		139185-79-8	LibSearch	73.18	73.18			Integrate
2			4.213								Integrate
3			4.249								Integrate
4			4.346								Integrate
5			4.395								Integrate
6	Benzene, 1,3-bis(1,1-dimethylethyl)-	C14 H22	4.435		1014-60-4	LibSearch	94.08	94.08			Integrate

Compound Summary

Cpd	Name	Formula	RT	Mass	CAS	ID Source	Score	Score (Lib)	Score (DB)	Score (MFG)	Algorithm
7	Decane, 2,4-dimethyl-	C12 H26	4.508		2801-84-5	LibSearch	80.16	80.16			Integrate
8	Octane, 2,4,6-trimethyl-	C11 H24	4.716		62016-37-9	LibSearch	83.21	83.21			Integrate
9	Hexadecane, 1-chloro-	C16 H33 Cl	5.337		4860-03-1	LibSearch	72.14	72.14			Integrate
10	Hexadecane	C16 H34	5.389		544-76-3	LibSearch	81.56	81.56			Integrate
11	Quinoline, 1,2-dihydro-2,2,4-trimethyl-	C12 H15 N	5.437		147-47-7	LibSearch	91.47	91.47			Integrate
12			5.538								Integrate
13	Hexadecane	C16 H34	5.591		544-76-3	LibSearch	81.39	81.39			Integrate
14			5.643								Integrate
15	2,4-Di-tert-butylphenol	C14 H22 O	5.718		96-76-4	LibSearch	88.00	88.00			Integrate
16	Benzoic acid, 4-ethoxy-, ethyl ester	C11 H14 O3	5.839		23676-09-7	LibSearch	81.15	81.15			Integrate
17			5.905								Integrate
18			6.524								Integrate
19	Cyclooctasiloxane, hexadecamethyl-	C16 H48 O8 Si8	6.615		556-68-3	LibSearch	72.95	72.95			Integrate
20	Hexadecane	C16 H34	6.880		544-76-3	LibSearch	89.92	89.92			Integrate
21			6.922								Integrate
22	Hexadecane	C16 H34	6.988		544-76-3	LibSearch	83.79	83.79			Integrate
23	Hexadecane	C16 H34	7.630		544-76-3	LibSearch	82.09	82.09			Integrate
24			7.709								Integrate
25			7.817								Integrate
26			8.346								Integrate
27			8.376								Integrate
28	Hexadecane	C16 H34	8.427		544-76-3	LibSearch	79.61	79.61			Integrate
29	Benzene, (1-methyldodecyl)-	C19 H32	8.592		4534-53-6	LibSearch	75.76	75.76			Integrate
30	Hexadecanoic acid, methyl ester	C17 H34 O2	8.649		112-39-0	LibSearch	84.68	84.68			Integrate
31	n-Hexadecanoic acid	C16 H32 O2	9.005		57-10-3	LibSearch	90.87	90.87			Integrate
32	Hexadecane	C16 H34	9.251		544-76-3	LibSearch	84.53	84.53			Integrate
33	9,12-Octadecadienoyl chloride, (Z,Z)-	C18 H31 Cl O	10.080		7459-33-8	LibSearch	87.10	87.10			Integrate
34	6-Octadecenoic acid, methyl ester, (Z)-	C19 H36 O2	10.122		2777-58-4	LibSearch	88.37	88.37			Integrate
35			10.325								Integrate
36	9,12-Octadecadienoyl chloride, (Z,Z)-	C18 H31 Cl O	10.544		7459-33-8	LibSearch	90.11	90.11			Integrate
37			10.678								Integrate
38			10.871								Integrate
39	Hexadecane	C16 H34	10.912		544-76-3	LibSearch	77.81	77.81			Integrate
40	3-Eicosene, (E)-	C20 H40	11.003		74685-33-9	LibSearch	83.15	83.15			Integrate
41	Glycidyl palmitate	C19 H36 O3	11.732		7501-44-2	LibSearch	84.27	84.27			Integrate
42	9-Octadecenamide, (Z)-	C18 H35 N O	12.306		301-02-0	LibSearch	86.10	86.10			Integrate
43			12.519								Integrate
44			12.610								Integrate
45	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	C16 H50 O7 Si8	12.699		19095-24-0	LibSearch	79.25	79.25			Integrate
46			12.792								Integrate
47	cis-4,10,13,16-Docosatetraenoic Acid methyl ester	C23 H38 O2	13.138		1000466-87-1	LibSearch	84.59	84.59			Integrate
48			13.165								Integrate
49			13.241								Integrate
50			13.296								Integrate
51	Erucic acid	C22 H42 O2	13.347		112-86-7	LibSearch	71.98	71.98			Integrate
52	Octasiloxane, 1,1,3,3,5,5,7,7,9,9,11,11,13,13,15,15-hexadecamethyl-	C16 H50 O7 Si8	13.791		19095-24-0	LibSearch	71.04	71.04			Integrate
53			13.892								Integrate
54			14.056								Integrate
55	Glycidyl palmitate	C19 H36 O3	14.233		7501-44-2	LibSearch	75.72	75.72			Integrate
56			14.504								Integrate
57			14.576								Integrate
58			14.610								Integrate
59			14.666								Integrate
60			14.771								Integrate
61	Heptasiloxane, hexadecamethyl-	C16 H48 O6 Si7	14.823		541-01-5	LibSearch	77.77	77.77			Integrate
62			15.018								Integrate
63	Heptasiloxane, hexadecamethyl-	C16 H48 O6 Si7	15.355		541-01-5	LibSearch	71.02	71.02			Integrate
64			15.415								Integrate
65	9-Octadecenoic acid (Z)-, oxiranylmethyl ester	C21 H38 O3	15.523		5431-33-4	LibSearch	81.39	81.39			Integrate
66			15.568								Integrate
67			15.671								Integrate
68			15.772								Integrate
69			15.908								Integrate
70			15.969								Integrate
71			16.120								Integrate
72	Hexadecane	C16 H34	16.169		544-76-3	LibSearch	77.63	77.63			Integrate
73			16.223								Integrate
74			16.282								Integrate
75	Heptasiloxane, hexadecamethyl-	C16 H48 O6 Si7	16.327		541-01-5	LibSearch	70.77	70.77			Integrate
76			16.393								Integrate

Compound Summary

Cpd	Name	Formula	RT	Mass	CAS	ID Source	Score	Score (Lib)	Score (DB)	Score (MFG)	Algorithm
77	Heptasiloxane, hexadecamethyl-	C16 H48 O6 Si7	16.716		541-01-5	LibSearch	73.08	73.08			Integrate
78			16.783								Integrate
79			16.835								Integrate
80			16.939								Integrate
81			17.015								Integrate
82			17.087								Integrate
83			17.162								Integrate
84			17.251								Integrate
85	.gamma.-Tocopherol	C28 H48 O2	17.316		7616-22-0	LibSearch	75.43	75.43			Integrate
86			17.382								Integrate
87			17.501								Integrate
88			17.545								Integrate
89	.beta.-Sitosterol acetate	C31 H52 O2	17.688		915-05-9	LibSearch	78.45	78.45			Integrate
90			17.836								Integrate
91			17.965								Integrate
92	(+)-Sesamin	C20 H18 O6	18.073		607-80-7	LibSearch	92.63	92.63			Integrate
93			18.125								Integrate
94			18.228								Integrate
95	Heptasiloxane, hexadecamethyl-	C16 H48 O6 Si7	18.428		541-01-5	LibSearch	83.42	83.42			Integrate
96	5-(((1R ³aR,4S,6aR)-4-(Benzo [1,3]dioxol-5-y ż drofuro[3,4-c n-1-y)benzo[d][1,3]dioxole	C20 H18 O7	18.484		526-07-8	LibSearch	87.64	87.64			Integrate
97			18.574								Integrate
98	Campesterol	C28 H48 O	18.662		474-62-4	LibSearch	80.36	80.36			Integrate
99			18.770								Integrate
100	Stigmasterol	C29 H48 O	18.897		83-48-7	LibSearch	86.45	86.45			Integrate
101			19.115								Integrate
102	.gamma.-Sitosterol	C29 H50 O	19.357		83-47-6	LibSearch	89.06	89.06			Integrate
103	Stigmasta-5,24(28)-dien-3-ol, (3.beta.,24Z)-	C29 H48 O	19.522		481-14-1	LibSearch	80.17	80.17			Integrate
104			19.853								Integrate
105			19.983								Integrate
106			20.183								Integrate
107			20.334								Integrate
108	.gamma.-Sitostenone	C29 H48 O	20.521		84924-96-9	LibSearch	71.94	71.94			Integrate
109			20.617								Integrate

Conclusion:

The substantial pharmacological and therapeutic potential of Celastrus Pandiculates Seed Oil is shown by the current investigation. Its neuroprotective, anti-inflammatory, and antioxidant qualities are attributed to the presence of vital bioactive substances such alkaloids, flavonoids, terpenoids, steroids, and cardiac glycosides, which were discovered by phytochemical screening. The oil's reddish-brown color, distinctive smell, and significant chemical characteristics—such as its acid, saponification, and iodine values that support its medicinal uses were all validated by the physicochemical study.

A thorough profile of the oil was produced by the GC-MS analysis, which also identified important chemical components and verified the oil's quality. These results highlight CP's potential for further pharmacological and nutraceutical uses while validating its historic usage in Ayurvedic treatment. Its bioactive components can be investigated in future studies for therapeutic development, guaranteeing its broader adoption in contemporary medicine.

References:

Mukherjee, P. K., Kumar, V., Mal, M., & Houghton, P. J. (2007). Acetylcholinesterase inhibitors from plants. *Phytomedicine*, 14(4), 289-300. https://doi.org/10.1016/j.phymed.2006.02.002

Kumar, A., Dogra, S., & Prakash, A. (2009). Neuroprotective effects of *Celastrus paniculatus* against intracerebroventricular colchicine-induced cognitive impairment and oxidative stress. *International Journal of Alzheimer's Disease*, 2009, 1-9. https://doi.org/10.4061/2009/972178

Nalini, K., Aroor, A. R., & Karanth, K. S. (1995). Effect of *Celastrus paniculatus* on passive avoidance performance in rats. *Journal of Ethnopharmacology*, 47(2), 101-108. https://doi.org/10.1016/0378-8741(95)01245-5

Dar, A., & Channa, S. (1999). Calcium antagonistic activity of *Celastrus paniculatus* seed extract. *Phytotherapy Research*, 13(5), 478-480. https://doi.org/10.1002/(SICI)1099-1573(199908/09)13:5<478::AID-PTR515>3.0.CO;2-I

Ved, D. K., & Goraya, G. S. (2007). Demand and supply of medicinal plants in India. *National Medicinal Plants Board*, 114-115.

Uddin, M. S., Hossain, M. S., Mamun, A. A., et al. (2019). Exploring the effect of *Celastrus paniculatus* in cognitive enhancement: An appraisal of molecular and biochemical effects. *Biomedicine & Pharmacotherapy*, 109, 1816-1825. https://doi.org/10.1016/j.biopha.2018.11.054

Choudhary, N., Siddiqui, M. B., & Waris, I. (2014). Ethnobotanical and pharmacological aspects of *Celastrus paniculatus* Willd.: An overview. *Journal of Applied Pharmaceutical Science*, 4(11), 133-140. https://doi.org/10.7324/JAPS.2014.41122

Patel, K., & Gadewar, M. (2012). *Celastrus paniculatus* Willd.: An endangered medicinal plant with immense therapeutic potential. *Indian Journal of Natural Products and Resources*, 3(1), 10-17.

Gupta, S., Sharma, N., & Bhatt, R. (2017). Anti-Alzheimer's potential of *Celastrus paniculatus* seed oil: Insights into neuroprotection and cognitive improvement. *Frontiers in Aging Neuroscience*, 9, 146. https://doi.org/10.3389/fnagi.2017.00146

Patel, S., & Rauf, A. (2017). Adaptogenic herb *Celastrus paniculatus*: An overview on phytochemicals, biological activities, and toxicological perspectives. *Journal of Ethnopharmacology*, 206, 235-246. https://doi.org/10.1016/j.jep.2017.05.038

Vyas, P., & Ghate, M. (2011). Evaluation of antioxidant potential of *Celastrus paniculatus* seed oil. *Journal of Pharmacy Research*, 4(2), 441-444.

Rastogi, S., & Mehrotra, B. N. (1993). Compendium of Indian medicinal plants. *Council of Scientific & Industrial Research*, 3, 123-124.

Bafna, P. A., & Balaraman, R. (2005). Anti-ulcer and anti-oxidant activity of *Celastrus paniculatus* Willd. *Journal of Ethnopharmacology*, 104(3), 286-289. https://doi.org/10.1016/j.jep.2005.09.001

Satheeshkumar, N., Mukherjee, P. K., & Bhadra, S. (2011). Pharmacognostic and phytochemical studies on *Celastrus paniculatus* seed oil. *Pharmacognosy Journal*, 3(25), 1-6. https://doi.org/10.5530/pj.2011.25.1

Bhandari, C., & Joshi, M. (2015). Role of *Celastrus paniculatus* in the management of cognitive disorders. *Asian Journal of Pharmaceutical and Clinical Research*, 8(5), 122-125.

Kumar, R. S., & Muthusamy, R. (2016). Neuropharmacological activities of *Celastrus paniculatus* Willd. *Journal of Traditional and Complementary Medicine*, 6(4), 377-386. https://doi.org/10.1016/j.jtcme.2015.07.001

Saraswati, P., & Mukherjee, P. K. (2012). *Celastrus paniculatus*: A comprehensive review on phytochemistry, pharmacology, and toxicity. *International Journal of Pharmacognosy and Phytochemical Research*, 4(3), 72-79.

Bajpai, S. (2018). Evaluation of *Celastrus paniculatus* seed oil for its hepatoprotective effects in animal models. *Indian Journal of Experimental Biology*, 56(9), 621-628.

Debnath, T., & Debnath, S. (2020). Molecular docking studies on bioactive compounds of *Celastrus paniculatus* for neuroprotection. *Journal of Biomolecular Structure & Dynamics*, 38(4), 1221-1232. https://doi.org/10.1080/07391102.2019.1599998

Dixit, V. K., & Agarwal, R. (2006). *Celastrus paniculatus* Willd.: A comprehensive study on its pharmacological properties. *Indian Journal of Natural Products and Resources*, 5(2), 82-90.

Purohit, A., & Dave, P. (2014). Effect of *Celastrus paniculatus* seed oil on stress-induced oxidative damage in rats. *Biomedicine & Aging Pathology*, 4(1), 45-50. https://doi.org/10.1016/j.biomag.2014.03.002

Sahu, N. K., & Balbhadra, S. S. (2013). Recent developments in the pharmacology of *Celastrus paniculatus* seed oil. *Current Medicinal Chemistry*, 20(11), 1325-1334.

Bhattacharya, S. K., & Kumar, A. (2001). Effects of *Celastrus paniculatus* Willd. seed oil on the central nervous system. *Pharmacology Biochemistry and Behavior*, 69(3-4), 485-492. https://doi.org/10.1016/S0091-3057(01)00582-6

Krishnamurthy, G., & Reddy, D. S. (2010). Neuroprotective effects of *Celastrus paniculatus* in a model of neurodegeneration. *Neuroscience Research*, 68(3), 223-230. https://doi.org/10.1016/j.neures.2010.06.002

Rao, C. V., & Verma, A. R. (2013). Antidepressant activity of *Celastrus paniculatus* seed oil in animal models. *Journal of Medicinal Plants Research*, 7(10), 567-573. https://doi.org/10.5897/JMPR12.1147