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Comprehensive study in Phyto-Chemical Constituents of Vitex Trifolia

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Abstract –

A high performance chromatography combined with photodiode cluster locator strategy was created for the recognizable proof and measurement of phytochemical constituents present in vitex trifolia. To study phytochemical profile of leaves to isolate the mixes by utilizing segment and dainty layer chromatography methods to distinguish the phytochemical constituents by utilizing UV, FTIR TLC and HPLC examination of extricated plants part like leaves. So many chemicals and mixes were identified by utilizing HPLC procedure and correlation with standards. V. Trifolia is one of the underutilized restorative species with incredible pharmacological potential.

1.Introduction - Recently, enthusiasm for plant research has expanded everywhere throughout the world attributable to its expected use in customary frameworks of medication for rewarding a wide assortment of infections.^[11] A considerable lot of these plants neglected to draw consideration for their valuable restorative properties and their dynamic pharmacological substance stay to be unexposed.^[8] Despite the fact that home grown plants in rough structure are accessible for the treatment generally utilized. Vitex Trifolia L. is a shrubby tree that may grow up to 6 meters tall. The substance elements of Vitex for instance have been utilized as an antidiabetic, antibacterial, calming, antifungal, antinociceptive, against androgenic, anticonvulsant, cancer prevention agent, and hostile to tumor specialists and a few different advantages.^[29] Deductively demonstrated exercises relate to customary idea. Logical proof exists concerning their major and minor constituents.^[35]

Vitex Trifolia is a significant and compelling characteristic bioresource that has an enormous future for research. The oddity and pertinence of Vitex Trifolia are covered up. This current examination focuses on the investigation and use of its phytoconstituents and their usage. The mitigating capability of a fluid concentrate

of *Vitex Trifolia* leaves was examined by checking the consequences for the tweak of cytokines, go between of irritation, just as on the articulation inducible profiles of nitric oxide synthase. ^[11]

The essential oils of *Vitex Trifolia* have been appeared to showcase insecticidal activity. An abietane-type diterpene (named vitetrolin A) and two labdanetype diterpenes (named vitetrolins B and vitetrolin C) were isolated from the acetone extract of the fruits of *Vitex trifolia* Linn. Additionally, with 3 known diterpenes, dihydrosolidagenone, rotundifuran and abietatriene 3 β -ol. ^[1,2]

1.1 Plant description [8]:

Botanical name: *Vitex Trifolia* Linn. (Verbanaceae)

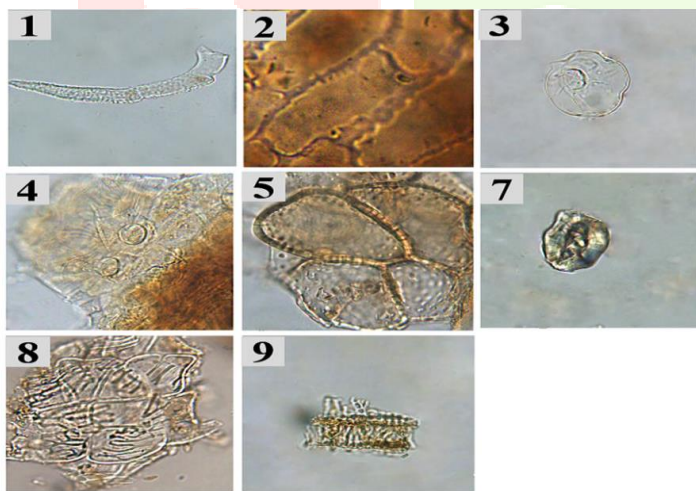
Table 1.2-Vitex Trifolia Linn Macroscopic Description

Scientific name	Family name	Part used	height	Length
<i>Vitex trifolia</i> Linn.	Verbanaceae	Leave and bark	1-4 meter, sometime prostrate or ascending in habit. Leaves simple or 3 - foliolate stalkless, oblong to oblong -elliptic	4-7 cm long, 1.5-4 cm wide, pointed at both ends, smooth and shining on the upper surface and sparsely covered with gray hairs beneath

1.2 Plant macroscopic and microscopy Evaluation –

1.1.2 Macroscopy of vitex Trifolia(9,10,11)

Fruits	Macroscopic character		Microscopic character	
	color	brownish black	Color of powder	Dark brown
	shape	nearly Spherical	Nonglandular hair	Two or three cells, hooked, 31–150 μm in length
	Polar diameter(mm)	5.0–7.0	Glandular scale	28–48 μm in diameter
	Equatorial diameter(mm)	3.0–6.0	Exocarp cell	Polygonal-like, with fine horny stripes on the surface
	Surface	Rough white sand-like protuberance	Mesocarp cell	Oval-like, densely covered with large pits
	Calyx	Yellowish-green, tomentose, covering 1/3 to 2/3 of surface	Sclereid	Nearly elliptical, 36–100 μm in length and 16–50 μm in diameter, containing calcium oxalate square crystal
			Testa cell	Polygon-like reticulocyte



Microscopic characteristics of the powder of vitex trifolia . One nonglandular hair, two epidermis cells of sepal, three glandular scales, four epidermal cells of exocarp, five mesocarp cells, six endocarp cells, seven sclereid, eight epidermal cells of testa, nine vessel

Leaves	Macroscopic character		Microscopic character	
	color	Green	Adaxial surface	140 µm thick along the ridged part of the leaflet and 120 µm thick in between the ridges
	Leaves	1-5 foliolate	Adaxial epidermis	Thick and prominent with rectangular cell
	Leaflets	oblong-elliptic to oblanceolate or obovate or almost round	Subepidermal layer	fairly thick walled with 10 µm thin cuticle
	Size	1.5–7 x 0.8–4 cm,	Hypodermal layer	15 µm thick
	Apex	emarginate or rounded to acute or acuminate	midrib	thick
	Base	cuneate to attenuate	Ground midrib tissue	circular thin-walled compact parenchyma cells
			Trichomes	dense non-glandular
	appearance	Puberulous to glabrescent and ± glandular above, tomentose beneath; petiole 0.6–3.3 cm long; petiolules 1–20 mm long	mesophyll	four layers of vertically elongated narrow cylindrical cells
	Taste	Bitter	Height of palisade and spongy parenchyma cells	Reduced gradually toward the lower part

1.3 Extraction process

The extract obtained in this manner might be prepared for use as a medicinal agent in the form of tinctures and fluid extracts; it may be additionally processed to be fused in any dosage form such as tablets or capsules. It may also be fractionated to isolate individual chemical entities of modern drugs such as ajmalicine, hyoscyne and vincristine. In this way, standardization of extraction technique contributes majorly to the final quality of the herbal drug. ^[2,4]

1.4 Taxonomical Classification

Kingdom: Plantae,

Class: Eudicots

Order: Lamiales,

Family: Lamiaceae,

Genus: Vitex,

Species: Trifolia.

Vernacular names

Sanskrit: Jalanirgundi,

Hindi: Nichinda,

Manipuri: Urikshibi,

Bengali: Paniki-shumbala,

Kannada: Nira-lakki-gida,

Malayalam: Lagondi, Nirnoschi,

Tamil: Nirnochchi, Shirunoch-chi,

Telugu: Niruvavili, Shiruvavili.

Table 1.3- Types of extraction

OLD EXTRACTION METHODS	ADVANCED EXTRACTION METHOD
Maceration	Microwave Assisted extraction
Infusion	
Digestion decoction	
Percolation	Supercritical fluid extraction
Hot continuous extraction (Soxhlet)	Ultrasonication Assisted extraction
Aqueous alcoholic extraction by fermentation	
Counter -current extraction	

Extraction technology^[10]

A standard process for extraction contains following steps ^[12]

1. Assortment and verification of plant material and drying
2. Reduction of Size
3. Purification
4. Filtration
5. Concentration
6. Reconstitution

1.4 Chemical Constituents Found in Vitex Trifolia L.^[3,7,9]

From the leaves investigators have bifurcated a new alkaloid-vitricin (0.05%) m.p. 237°C, sitosterol, its glucoside and a long chain hydrocarbon. Also, D- glucuronide, Iso orientin, 7-D- glucuronide of luteolin have been bifurcated from the leaves. Unsaponifiable matter (0.60%) contained γ -tocopherol and F3-sitosterol; essential oil from leaves contained phenol, 1,8- cineols, α - and f3-pinenes and α -terpineol, whereas vanillic acid and dulcitol were isolated from fruits. Stearic (12.55), Myristic (0.25), palmitoleic (1.65), palmitic (23.37), linoleic (20.97%) acids, oleic (24.47) were isolated from seed oil.^[5]

Two compounds specifically vitexicarpin and viteosin A have also been isolated. Hexane extracts and Alcoholic extract are gathered from plant part that have flavonoids such as artemetin, penduletin, vitexicarpin, luteolin, persicogenin and chrysosplenol-D for the first time.^[12] Vitexicarpin and Viteosin A and were isolated from the n-hexane extract of the plant leaves. Viteosin A has S config at c-5 and c-6. Five labdane-type diterpenes, 6-acetoxy-9-hydroxy 13(14)-labdane-16, rotundifuran, 15-olide, vitexilactone, vitetrifolin D and vitetrifolin E have been bifurcated from the plant.

Table 1.4 Name of the chemical constituents present in vitex trifolia leaves and bark

Si.no	Name of the chemical constituents	Leave	Bark	Yield percentage
1	Methyl-p-benzoate	+	+	0.03%
2	Essential oil	+	-	0.45%
3	7-D- glucuronide and D-glucuronide	+	+	1.03%
4	Artemetin	+	+	2.03%
5	7-Dimethyl artemetin	+	-	0.33%
6	F3-sitosterol	+	+	0.12%
7	Caryophyllene	+	-	0.32%
8	Sesquiterpene	+	+	0.67%
9	Vitricin	New alkaloid	-	0.02%
10	Palmitic acid	-	-	0.09%
11	Ethyl -p-Hydroxybenzoate	+	+	0.80%
12	Penduletin	-	-	1.0%
13	Vitexicarpin	+	-	0.86%
14	Polyphenolic compounds	+	+	1.98%
15	Proteins	+	+	2.80%
16	Tannins and saponins	+	+	0.90%-4.30%

Table 1.5 -Therapeutic Uses of Vitex Trifolia (Suchitra M. et al., 2018)

VITEX TRIFOLIA PARTS	USES
Leaves, Seeds, Bark, Fruits And Flowers (Ethanolic, alcoholic, petroleum ether ,di-chloro methane extract)	Hepatoprotective and anti-asthmatic
	Antioxidant
	Antifungal, anti-microbial, anti-bacterial
	Wound healing
	Anti-inflammatory
	Anti- tubercular
	Anticancer

Table 1.6 -Common species of vitex

Name of species	Uses
Vitex agnus-castus L	Anti-inflammatory
Vitex Trifolia L	Anti- asthmatic, antioxidant, anti-diabetic
Vitex altissima L	Anti-malarial
Vitex Negundo	Antioxidant, larvicidal, wound healing
Vitex Rotoundifolia	Anti-cancer
Vitex gardneriana	Anti -fungal
Vitex cymose	Anti-tubercular
Vitex limonifolia	Antinociceptive
Vitex doniana	insecticidal
Vitex diversifolia	Hepatoprotective, anti-diabetic
Vitex molis	Headache, wound healing
VitexMegapotamica	Anti-septic
Vitex leucoxydon	Antioxidant and anti-microbial
Vitex peduncularis Wall	Anti-inflammatory

1.5 Stages in Phytoconstituents scanning

When the plant is picked, the subsequent stage is its assortment and herbal distinguishing proof and afterward it ought to be submitted to an adjustment procedure. At the point when the security of the mixes is obscure or on the off chance that they are known to be shaky, the new plant ought to experience an adjustment procedure comprising of freezing, lyophilization, utilization of alcohol vapour.

The plant extracts are first qualitatively analysed by thin layer chromatography (TLC) and/or other chromatographic methods to obtain isolated active compounds, purification and isolation and screened to determine the biological activity and a general evaluation of biological activities, bioassay and toxicity evaluation¹¹. After verifying the purity of an isolated active compound, the structure is determined by spectroscopic methods (UV, IR, Mass Spectrum or NMR) and chromatography based methods (TLC, HPLC, GC). When the chemical structure is characterized, total or partial synthesis and preparation of derivatives and/or analogues can be considered and modulation of the biological activity and definition of the structure–activity relationship can be carried out.

Conclusion-

The plant *V. trifolia* is an aromatic coastal deciduous shrub grown India, Bangladesh, and Sri Lanka which is used as a traditional folk medicine for various ailments had been evaluated for in vitro antimicrobial, antioxidant, in vivo hepatoprotective, antinociceptive, antiasthmatic, antitubercular, and analgesic activity. The phytochemical constituent of the methanolic and ethanolic extracts of the aerial parts of the plant was evaluated and reported. Further, a detailed study on *V. trifolia* is necessary for the development of novel drugs in the arena antiandrogenic, antiarthritic, antidiabetic, antihypertensive, neuropathic, antiulcer, antipsychotic, and anticoronary activity to be done.

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