A review of phytochemical constituents and pharmacological activity of thuja species

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ABSTRACT:
Our medical system depends on traditional health services. The primary application of this herb by the locals is in the treatment of different illnesses. Thuja is a part of the family of cupressaceae. This is a traditional Ayurvedic application of medicine. The genus Thuja contains five different species. three from Eastern Asia and two from North America. Reisolved genomic studies T. standishii and T. koraiensis, two sister sets and T. plicata, T. occidentals, and T. sutchuenensis T. occidentalis is T. sutchuenensis's sister. This The use of alternative medicine is growing. Thuja species are generally gaining popularity. Antiviral, antibacterial, antifungal, anti-HIV, anti-cancer, and anti-antidiabetic activity, antiviral effect and Thuja's immunopharmacological activity, as stimulation of cytokines and immune regulation Myeloid cell formation and activation are both increased. having undergone various tests. It contain about 0.6% basic oils, 2.07% dimishing sugar, 4.9% water dissolvable polysaccharides, 2.11% water Solvent minerals, 1.67% free cossosive and 1.31% tannic operators.

KEYWORDS: Thuja, Morparkhi, Phytochemistry, pharmacological Activity

1. INTRODUCTION:
An old Indian philosophy called Ayurveda is recognised as one of the most important systems of alternative and complementary therapies. The majority of treatments are based on regional herbs, just like in other herbal systems. The interest in traditional medicines has greatly increased in recent years. In addition, western nations favour it and are doing several studies on plant-based therapies.[1]

Originally originating in Northwest China, Thuja orientalis is a common ornamental evergreen tree that belongs to the Cupressaceae. It is quite fragrant and resinous shrub that is abundantly grown in gardens situated in semi-arid and temperate climates Thuja large evergreen shrubs or tiny, robust orientalis medium-sized trees, rarely growing taller than 20 metres nature. It is shaped like a dense pyramid, although frequently demonstrates a more open, spreading form. It chooses soil with good drainage and full light. There is bark. a thin but deep shade of grey with brown accents furrows. The bark has an appealing roughness about it. specifically on mature, big specimens.[2]

Thuja are petite, slender, and distal. The females' tiny, green or purple cones are far shorter than the males' big, reddish or yellowish cones. It is a spacious, humid area with abundant plants and a propensity for budding shrubs.[3]

Thuja is an evergreen tree with a reddish brown crust that can grow to be 10 to 200 feet tall. The needles are often scaly, like in the first year, and the leaves are typically 1 to 10 mm long. Most often, attractive plants are grown. In place of decoupage, the leaves are placed on the branches in four rows, two by two. The blossoms are symmetrical (only a few are male or female, although both genders can be found on the same plant), and the wind cross-pollinated them. Typically, male and female flowers grow on different branches or twigs.[4]

TAXONOMICAL CLASSIFICATION:

Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Pinophyta
Subphylum: Euphyllophytina
InfraPhylum: Radiotopes
Class: Pinopsida
Order: Pinales
Family: Cupressaceae
Tribe: Spiraeae
Genus: Thuja

Vernacular Names:
Hindi: Morparkhi.
Marathi: Thuja, Morphankhi
Chinese: Baishu, Xiangbai, Cebai, Bianbai
Italian: Tuiaorientale
Japanese: Konotegashia
Spanish: Uya De La China

Trade Name: Chinese arborvitae
English: Thuja orientalis, Biota, Tree of life, Book leaf pine.
French: Thuya oriental, ThuyaD’orient, Thuya De Chine
German: Morgenlandischer Lebensbaum, Chinesiche Thuja, Lebensbaum, Scientific Synonyms: Cupressus pendula Thunb.
Platycladus stricta Spach
Thuja acuta Moench
Thuja decora Salisb.
Thuja orientalis L.
The five species of Thuja are-
Thuja koraiensis- Korean Thuja
Thuja occidentalis- Eastern Arborvitae, Northern White cedar
Thuja plicata- Western Red cedar
Thuja standishii- Japanese Thuja
Thuja sutchuenensis- Sichuan Thuja
Thuja koraiensis:

One of the coniferous or evergreen shrubs in the genus Thuja, which is a constituent of the evergreen family, is known by the widespread name "tree of life" (William and Jackson, 1967). Native Americans and early European physicians used thuja leaves, which are rich in vitamin C, to treat scurvy. The leaves are used to treat rheumatism. The plant commonly used to cure warts, the genitalia, and the human papillomavirus (HPV) is referred to as a curiosity. 3 to 10 metres in height. The leaves grow in a flat form with huge, 2 to 4 mm (or up to 15 mm) long leaves that are dark green on top and have dark white waxy stripes on the reverse. Oval, yellow-green, ripe, reddish-brown, and measuring 7-11 mm long by 4-5 mm wide are the cones. [3]

Thuja occidentalis
Thuja occidentalis is most commonly known by the names Northern White Cedar, Thuiercedre, Cedre-Thuya occidentalis, and Eastern White Cedar. Eastern or American arborvitae White of the North. The monoecious conifer cedar grows to a height of About 15 to 38 metres, susceptible to obstruction or prostrate in a cold, harsh environment. Occasionally the divided into a few auxiliary stems, the trunk. Frequently imitating downed trees. The surface is fibrous, reddish brown or grey, 6 to 9 mm thick, and matted. Eggplant leaves range in size from 1.5 to 3.5 mm. Both surfaces are yellow-green and pointy. Pollen 1-2 ellipsoidal, red, 9–14 mm long blooms brown. [3]
Thuja standishii:
Japanese thuja, also known as nezuko or kurobe, is a species of thuja. On the islands of Honshu and Shikoku in southern Japan, it can be found close by. It is a medium-sized tree that stands 20–35 metres tall and has a trunk that may reach 1 metre in height. The foliage is arranged in level showers and has narrow, white stomatal clusters beneath scale-like, 2–4 mm long, matte green leaves on top. The cones are round, yellow-green with a reddish-heart center, 6–12 mm long, 4–5 mm wide (expanding to 8 mm wide), and covered in 6–10 scales. It is a prominent lumber tree in Japan, valued for its sturdy, water-resistant, seductively perfumed wood. There is some evidence that focuses on this biological diversity T standishii. [6]

Thuja sutchuenensis:
The Sichuan thuja, or Thuja sutchuenensis, is a species of coniferous evergreen tree in the Cupressaceae family of cypresses. It is specific to China, where it is an endemic disease that poses a concern. On the southern level of Chengkou County Mountains of Daba This tree is small to medium-sized, rising up at maybe 20 m tall, yet there are no trees, are currently known to begin at this size. The trees buildings sprinkled with leaves that resemble scales 1.5–4 mm long with a tight white border and a green top. Stomatal clusters beneath cones are round, oval, naturally shaded green, 5–8 mm 3–4.2 mm in length and broad (opening to 7 mm wide), with scales ranging from 8 to 10. [8]

PHYTOCHEMISTRY:
Approximately 0.6% of the plant's essential oil (EO), 2.07% of reducing sugars, 4.9% of polysaccharides, 2.11% of minerals, 1.67% of free acids, and 1.31% of tannins are present in the fresh plant. [9] The preponderance of the monoterpenes found in the EO extracted from fresh leaves are thujone (65%), isothujone (8%), and It contains 2% -pinene, 5% sabine, and 8% fenchone. Other monoterpenes that have been identified include carvotanacetone, origanol, origanes, myrcene, and camphene. Furthermore, it has been demonstrated that high-molecular-weight glycoproteins or polysaccharides are especially pertinent for plant action. The dry plant contains between 1.4 and 4% EO, which is made up of the following compounds: borneol, camphene, fenchone, limonene, myrcene, -terpine, terpinolene, thujone, and thujyl alcohol. The primary component of the EO made from the dry plant, thujone, which comprises 85% thujone and 15% thujone, is present in amounts ranging from 0.76 to 2.4%. The dry plant also contains coumarins, which are symbolized by p-coumaric acid. [10,11,12]
Table 1: The dried Thuja occidentalis herb having following constituents\textsuperscript{[3,8]}

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Secondary Metabolites</th>
<th>Active Constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Flavonoids</td>
<td>Kaempherol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Catechine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Galloclatechine</td>
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<tr>
<td></td>
<td></td>
<td>Alpha-rhamnoside</td>
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<td></td>
<td></td>
<td>Mearnsitrin</td>
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<tr>
<td></td>
<td></td>
<td>Myricitrin</td>
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<tr>
<td></td>
<td></td>
<td>Quercetin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quercitrin</td>
</tr>
<tr>
<td>2.</td>
<td>Tannins</td>
<td>Catechine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Galloclatechine</td>
</tr>
<tr>
<td>3.</td>
<td>Coumarins</td>
<td>P-coumaric acid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Umbelliferone</td>
</tr>
<tr>
<td>4.</td>
<td>Essential oils</td>
<td>Borneal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comphene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fenchone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limonene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alpha – terpene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thujone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Terpinolene</td>
</tr>
<tr>
<td>5.</td>
<td>Proanthocynides</td>
<td>Procynidine beta-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prodelphinidine</td>
</tr>
</tbody>
</table>
PHARMACOLOGICAL ACTIVITY:
The biological action of aromatic and therapeutic plants is mostly mediated by mono- and sesquiterpenes, which also include phenols, alcohols, ethers, aldehydes, and ketones. Internal use of Thuja orientalis is used to treat a variety of conditions, including coughs, hemorrhages, heavy periods, bronchitis, asthma, skin infections, mumps, bacterial dysentery, arthritic pains, and premature blandness. The leaves have stomachic, emmenagogue, emollient, expectorant, antipyretic, astringent, diuretic, and emollient properties. [15,16] Their use is supposed to enhance hair growth. The seed is sedative, aperient, and lenitive. It is administered internally to treat geriatric constipation, sleeplessness, neurological disorders, and palpitations. Burns and scalds are treated with bark. The stems are used to cure rheumatism, diarrhea, coughs, colds, and parasitic skin conditions. [17,18,19]

Table 2: Pharmacological Activity with Phytoconstituents-

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Pharmacological Activity</th>
<th>Species</th>
<th>Plant Part</th>
<th>Mode of action</th>
<th>Phytochemistry</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Antimicrobial</td>
<td>T.koraiensis</td>
<td>Leaves</td>
<td>Decrease the activity of gram negative and positive bacteria</td>
<td>Alpha-thujone, Gamma-terpinene, Terpinolene, Methyl hexadecanoate</td>
<td>[21,23]</td>
</tr>
<tr>
<td>2.</td>
<td>Antiviral</td>
<td>T.koraiensis</td>
<td>Leaves</td>
<td>Inhibition of HIV</td>
<td>Alpha-thujone, gamma-terpinene acetate</td>
<td>[21]</td>
</tr>
<tr>
<td>3.</td>
<td>Antibacterial</td>
<td>T.occidentalis</td>
<td>Leaves</td>
<td>Decrease the activity of negative and positive bacteria</td>
<td>Thujaone 85% alpha thujone 15% beta thujone</td>
<td>[22]</td>
</tr>
<tr>
<td>4.</td>
<td>Anticancer</td>
<td>T.occidentalis</td>
<td>Leaves</td>
<td>Increase ROS generation, increase DNA fragmentation</td>
<td>Longifolone, Myrtenyl acetate, 3-cyclohexidine, Beta-pinene Estragole</td>
<td>[23,24,25,26]</td>
</tr>
<tr>
<td>5.</td>
<td>Anti-HIV</td>
<td>T.occidentalis</td>
<td>Leaves</td>
<td>Inhibited HIV at a concentration of 625 ug/ml</td>
<td>Thujaone 85% alpha thujone 15% beta thujone</td>
<td>[27,28]</td>
</tr>
<tr>
<td>7.</td>
<td>Antioxidant</td>
<td>T.occidentalis</td>
<td>Leaves</td>
<td>Increase DPPH, NO, increase anti-LPO activity</td>
<td>Beta-pinene Limonene Linalool 4-terpinol</td>
<td>[22,27,28,29]</td>
</tr>
<tr>
<td>8.</td>
<td>Antidiabetics</td>
<td>T.occidentalis</td>
<td>leaves</td>
<td>Improve glucose homeostasis in alloxaninduced diabetes</td>
<td>Borneal Camphene Limonene Alpha-thujone Beta-thujone</td>
<td>[28]</td>
</tr>
</tbody>
</table>
II. CONCLUSION:
The current literature leads to the conclusion that T orientalis & their substituents has excellent potential against a variety of health issues, including bacterial, fungal, and worm infections. It contain anti-inflammatory, antioxidant, antiviral, insecticidal, nematocidal, and pesticidal properties. It has recently demonstrated antidiabetic properties and liver protective properties.

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