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PHARMACOLOGICAL ACTIVITY OF *THUJA ORIENTALIS* LINN.

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ABSTRACT: *Thuja orientalis* (Commonly- Morpankhi, Family- Cupressaceae) is an evergreen, monoecious trees or shrubs used in various forms of traditional medicines and homeopathy in various ways. In traditional practices, *Thuja* is used for the treatment of bronchial catarrh, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea, and rheumatism. Recent researches in different parts of the world have shown that *Thuja orientalis* and its active component thujone have the great potential against various health problems. *Thuja orientalis* preparations can be efficiently used against microbial/worm infection. It can be used as antioxidant, anticancer and anti-inflammatory agent. Instead of these effects, it can also be used as insecticidal, molluscicidal and nematicidal activity against different pests. The present review highlights some important biological properties of *Thuja orientalis*.

INTRODUCTION: *Thuja orientalis* is a common ornamental evergreen tree that is originally native to North-west China belonging to family Cupressaceae. It is a highly aromatic and resinous shrub that widely cultivated in gardens located in temperate and semi-temperate areas. *Thuja orientalis* is a hardy, large evergreen shrub or small to medium sized-tree rarely exceeding 20 m in nature. It has a dense, pyramidal shape, but often exhibits a more open and spreading form. It prefers moist, well-drained soil and full sun. The bark is gray with brown highlights and has thin but deep furrows. The bark has a rugged charm about it, especially on large mature specimens. Younger bark is a reddish-brown color and exfoliates in long, thin strips.

It is endemic to north-western China. It is also now naturalized as an introduced species elsewhere in Asia: eastward to Korea and Japan; southward to northern India; and westward to northern Iran. The common name 'arbor-vitae' is from Latin, 'Tree of life,' and is based on its association with long life and vitality in Buddhist thought in China. This is probably based on the tree's unchanging evergreen nature in the cold, dry climate of northwest China and its longevity; some of the larger specimens planted around Buddhist temples in China are said to be more than 1,000 years old.

Although, generally accepted as the only member of its genus, it has been included by botanists in the different classification. In older texts, *Platycladus* was often included in *Thuja*, but it is only distantly related to that genus. Differences from *Thuja* include distinct cones, wingless seeds, and almost scentless foliage. Later, genus name has been changed as *Biota orientalis* and latest as *Platycladus orientalis*. But, it has been still known and sold as *Thuja orientalis* in the market¹.

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Plant Profile:**Taxonomical Classification:**

Kingdom:	Plantae
Division:	Coniferophyta
Class:	Pinopsida
Order:	Pinales
Family:	Cupressaceae
Genus:	Platycladus

Vernacular Names:

Hindi: Morpankhi.

Marathi: Thuja, Morphankhi

Chinese: Baishu, Xiangbai, Cebai, Bianbai

Italian: Tuiaorientale

Japanese: Konotegashiwa

Spanish: Uya De La China

Trade Name: Chinese arborvitae

English: Thuja orientalis, Biota, Tree of life, Book leaf pine.

French: Thuja oriental, ThujaD'orient, Thuja De Chine

German: Morgenlaendischer Lebensbaum, Chinesische Thuja, Lebensbaum,

Species:

Thuja koraiensis

Thuja occidentalis L.

Thuja plicata

Thuja standishii

Thuja sutchuenensis

Synonyms:

Biota orientalis,

Cupressus pendula Thunb.

Platycladus stricta Spach

Thuja acuta Moench

Thuja decora Salisb.

Thuja orientalis L.

Morphology Plant:

Plant Type: Shrub or small

Origin: Northwest China

Height: 15 to 20 feet

Spread: 10 to 15 feet

Plant habit: Spreading

Leaves: Leaves light green or yellow-green, becoming brown after 3 or 4, seasons, persistent, scale-like, in opposite-decussate pairs.

Flowers: Not ornamentally important, Monoecious

Fruit: Fleshy, glaucous blue-green color when developing, Woody horn-like cone when mature, Medium-brown color.

Bark: Shredding, Brown to gray-brown color³.



FIG. 1: TREE, SEED, AND BARK

Chemical Constituents: The main constituents of essential oils mono- and sesquiterpenes including carbohydrates, phenols, alcohols, ethers, aldehydes, and ketones are responsible for the biological activity of aromatic and medicinal plants. *Thuja orientalis* leaves contain rhodoxanthin, amento-flavone, hinokiflavone, quercetin, myricetin, carotene, xanthophylls and ascorbic acid. The seed yields fatty oil having the following composition

palmitic 5.28, stearic, 7.3; C₁₈ unsaturated acids, 1829 (Linolenic, 44.6%); and C₂₀ unsaturated acids, 6.10%. The Heartwood contains aromadendron, taxifolin, widdrene, cedrol, thujopsadiene, dehydro - α -curcumene, β -isobiotol, and curcumenether. The fruit oil contained α -Pinene (52.4%), 3-Carene (14.2%), α -Cedrol (6.5%) and phellandrene (5.1%), the leaf oil contained α -pinene (21.9%), α -cedrol (20.3%), 3-carene

(10.5%) and limonene (7.2%) as the main components. Thujone is a ketone and a

monoterpene that occurs naturally in two diastereomeric forms: α -Thujone and β -Thujone.

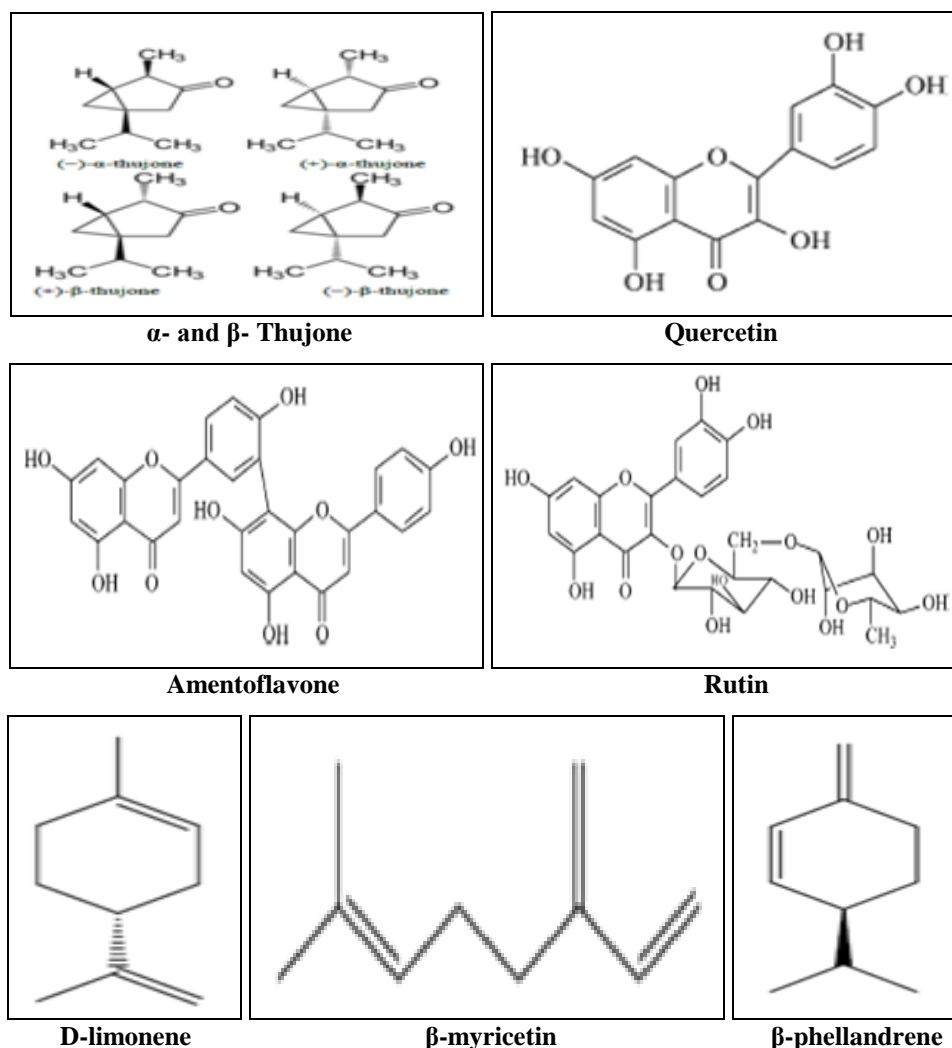


FIG. 2: CHEMICAL CONSTITUENTS OF *THUJA ORIENTALIS*

Uses: It has been used in the treatment of various diseases as folk medicine such as rheumatism, gout, dermatitis, and diarrhea. The plant has been exhibited extensively biological activities including anti-epileptic, anti-inflammatory, hair growth-promoting, antiviral, anti-allergic, anti-bacterial, antioxidant, and antifungal activities.

Traditionally it is used in the treatment of cough. It is also used as a medicinal plant in various forms of traditional medicines like folk medicine, homeopathy, etc. for treatment of bronchial catarrh, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea, and rheumatism. The root bark is used in the treatment of burns and scalds. The stems are used in the treatment of coughs, colds, dysentery and parasitic skin diseases. The leaves are antibacterial, antipyretic, antitussive, astringent,

diuretic, refrigerant and stomachic. It can also be used as Insecticidal, molluscicidal and nematicidal activity against different pests. *Thuja orientalis* is used internally in the treatment of coughs, hemorrhages, excessive menstruation, bronchitis, asthma, skin infections, mumps, bacterial dysentery, arthritic pains, and premature blandness. The leaves are antipyretic, astringent, diuretic, emmenagogue, emollient, expectorant, refrigerant and stomachic. Their use is said to improve the growth of hair.

The seed is aperients, lenitive and sedative. It is used internally in the treatment of palpitations, insomnia, nervous disorder and constipation in the elderly. The stems are used in the treatment of coughs, colds, dysentery, rheumatism and parasitic skin diseases. Thujone was a weak inhibitor of

acyl-CoA: lysophosphatidylcholine acyl-transferase activity in mouse brain synaptosomes compared to psycho-active cannabinoids.

Biological Activity:

Antipyretic Activity: In the present study the alcoholic extract of the leaf of *Thuja orientalis* were studied for their antipyretic activity by Brewer's yeast-induced pyrexia in rats. It was observed that the alcoholic extract produced significant antipyretic activity ($p < 0.05$). The extract showed marked antipyretic activity in a dose-dependent manner. The antipyretic activity of the alcoholic extract was evaluated based on Brewer's yeast-induced pyrexia in rats.

Pyrexia was induced by subcutaneous injection of 10 ml/kg of 15% w/v Brewer's yeast suspension below the nape of the neck. The rectal temperature of each rat was measured at the time, 0 hr, using a telethermometer and before injection of the yeast, at 18 hr following yeast injection, the different groups were treated with the alcoholic extract (200 and 400 mg/kg), and standard drug, paracetamol (150 mg/kg). Tween 80 (1% v/v) was used as a suspending agent. The rectal temperature was then recorded throughout 6 h².

Anthelmintic Activity: The activity of drugs that expel parasitic worms (helminths) and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host is called anthelmintic activity. The aerial parts of *Thuja orientalis* showed anthelmintic activity. The anthelmintic activity was determined for the methanolic extract of a real part of *Thuja orientalis*, which displayed significant anthelmintic properties at higher concentration. The extract revealed anthelmintic activity in a dose-dependent manner which is effective against parasitic infections of human^{11, 12}.

Hair Growth - Promoting Activity: *Thuja orientalis* leaves are traditionally used to promote hair growth. Studies proved that the leaves contained strong 5-reductase inhibitors, which may be associated with hair growth promoting activity. Another study showed the decoction of the leaves could promote hair growth by inducing anagen in telogenic C57BL/6 N mice. In decoction-treated mice, an increase in the number and size of hair follicles can be observed, which served as a piece

of evidence for the induction of anagen phases. Using the immunohistochemical analysis, an earlier induction of β -catenin and Sonic hedgehog (Shh) proteins in the decoction-treated group also can be seen, compared to the control or 1% minoxidil-treated group. Therefore, the hair growth-promoting activity can be explained by the inhibition of 5-reductase and induction of β -catenin and Shh proteins⁴.

Antimicrobial Potential of Various Fractions of *Thuja orientalis*:

The present study was conducted to evaluate the antimicrobial activity of various extracts (*viz.* methanol, acetone and ethyl acetate) of *Thuja orientalis* and its preliminary phytochemical screening. *In-vitro* antimicrobial activity was tested by agar well diffusion assay against human pathogenic microbes which are Gram-positive (*viz.* *S. aureus* and *B. subtilis*), Gram-negative bacteria (*viz.* *P. aeruginosa*, *A. faecalis*, and *K. pneumonia*) and fungi (*A. flavus* and *A. niger*). Methanol and acetone extract of leaf exhibited maximum activity against *B. subtilis* with zones of inhibition of 20.33 mm and 17.83 mm, respectively.

All the extracts of the stem were found to be most effective against *P. aeruginosa*. *S. aureus* was found to be sensitive to leaf extracts prepared in methanol, acetone and ethyl acetate with 13.66, 14.03 and 15.00 mm zone of inhibition, respectively. *A. flavus* and *A. niger*, both were found to be sensitive towards the methanol extract of the leaf with inhibition zones of 15.50 and 16.00 mm, respectively compare to fungicides (*viz.* ketoconazole and fluconazole). The methanol extract of leaf and ethyl acetate extract of stem exhibit marked antimicrobial activity against *B. subtilis* and *P. aeruginosa*, which was comparable to standard antibiotics (that is, penicillin, ampicillin, tetracycline, and streptomycin). It was also observed that leaf extracts were more effective as compared to stem extracts of the plant. Thus, *Thuja orientalis* could be considered as a potential source of natural antimicrobials used for the treatment of bacterial and fungal infections⁷.

Anti-inflammatory and Analgesic Activity: This study was conducted for evaluating a natural source to treat inflammation and pain, to avoid the severe side effects of currently used agents for these

ailments. *Thuja orientalis* (More Pankh) is commonly used for the treatment of pain and inflammatory disorders in traditional medicine. Carrageenan-induced inflammatory model, acetic acid induced writhing test and hot plate methods were used to evaluate anti-inflammatory, peripheral and central analgesic properties of aqueous methanolic extract of *Thuja orientalis* fruit (To-Cr) in albino rats. Completely randomized design (CRD) was constructed for the study and one way ANOVA was applied to compare means. The results showed that TO-Cr has significant anti-inflammatory and analgesic properties⁹.

Antibacterial and Antioxidant Activity: In the present study, leaves of *Thuja orientalis* were powdered and extracted by soxhlet extractor in two solvent systems that are, (E1) ethyl acetate: chloroform: ethanol (40: 30: 30) and (E2) methanol: distilled water (70: 30). This study conferred the screening of phytochemical constituents, antioxidant activity and antibacterial activity of crude E1 and E2 extract and its fractions. Antioxidant activity was carried out by the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay. The results indicate that E2 extract (70% methanolic extract) had the highest antioxidant effect (85.25% inhibition) at 100 µg/ml concentration and the crude extracts (E1 and E2 extract) showed significant ($P \leq 0.05$) inhibitory activity against both gram positive and gram-negative organisms. It was active against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Agrobacterium tumefaciens*.

The minimum inhibitory concentrations (MICs) of E1 extract ranged from 0.40 to 0.85 mg/ml and E2 extract 0.55 to 1.15 mg/ml. The highest antibacterial potentiality was exhibited by E2 extract. The fractions also exhibited antimicrobial activity against all the selected microorganisms. The study revealed that *Thuja orientalis* is a promising phytomedicine for antioxidant and antibacterial activity¹⁰.

Anticancer Activity: Strong 5 α -reductase inhibitor are extracted and fractionated from *T. orientalis* and purified as diterpenes in isolated form⁷. The inhibitors are used either on their own or as active ingredients of therapeutics in the treatment of diseases caused by the over activity of

5 α -reductase or the hyper- secretion of androgens, such as male baldness, androgenetic alopecia, hirsutism, acne, prostatomegaly and cancer of the prostate reported that the hepato-protective activities and antioxidant activity of *Thuja occidentalis* Linn.^{7, 8} Anti-proliferative and apoptosis-inducing properties of the thujone-rich fraction (TRF) separated from *Thuja occidentalis*. Their possible anti-cancer potentials have been noted in the malignant melanoma cell line A375⁶. Concluded that a poly-saccharide, or long-chain sugar molecule, derived from Thuja leaves extract decreased the inflammation caused by cancer. It also prevented cancer from metastasizing or spreading throughout the body¹¹.

Antiviral Activity: *In-vitro*, the antiviral activities of the plant extracts were investigated using the cell-based screening. Plant extracts of *Thuja orientalis* were shown to induce a high cell viability rate after the infection with the influenza A/PR/8/34 virus. The antiviral activity of the plant extracts also increased as a function of the concentration of the extracts and these extracts significantly reduced the visible cytopathic effect caused by virus infections. Furthermore, the treatment with *Thuja orientalis* was shown to have a stronger inhibitory effect than that with *A. spathulifolius* or *P. thunbergii*. These results may suggest that *Thuja orientalis* has anti-influenza A/PR/8/34 activity⁵.

CONCLUSION: I concluded from my review that *Thuja orientalis* Linn. traditionally widely used the medicinal plant. *Thuja orientalis* is a common ornamental evergreen tree. It shows a wide range of biological activities that helps to utilize the medicinal benefits of this plant. However, there remains immense scope for further exploration of this plant and needs the attention of scientists to exploit the full potential activities of this plant.

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