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Plant with Beneficial Properties *Thuja Occidentalis* L. (Cupressaceae) - A Review

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Abstract: ***The conventional system of medicine plays a noteworthy role in our health care system for the treatment of mankind. Thuja occidentalis called the tree of life is an endemic plant in eastern North America and cultivated in northern Europe and as ornamental tree in many other parts of the world. Thuja occidentalis is commonly used herb in Ayurvedic medicine. Recently, preclinical studies have identified the presence of polysaccharides, flavonoids, tannins and proteins in the ethanol fraction, which showed antioxidant, antidiabetic and antiulcerative activity. From the clinical studies of various researchers proving its immune-stimulant and action against warts, however no need to isolate the constituents responsible for the therapeutic action and to establish of quality parameters for plant drug and its derivatives, capable of ensuring the effectiveness, safety and quality of products from T. occidentalis. This plant is having ornamental value and also used in landscape architecture. This plant is also become the part of some famous world cuisine.***
Keywords: Thuja occidentalis; antidiabetic; ayurvedic medicine; immune-stimulant

I. INTRODUCTION

Thuja occidentalis belonging to family Cupressacae is a well known medicinal plant and ornamental plant. *Thuja occidentalis*, commonly known as American Arbor vitae or white cedar, is indigenous to eastern North America. The plant was first recognized as a cure by native Indians in Canada during a 16th century voyage and was found to prove effective in the treatment of weakness from scurvy. In context of folk medicine, *Thuja occidentalis* has been used to treat bronchial catarrh, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea and rheumatism (Shimada, 1956). Several reviews and monographs portray the botany, constituents and some pharmacological properties, and the use of this herbal substance in the treatment of the common cold. This review is to give inclusive information on the importance of *Thuja occidentalis* (Bodinet *et al.* 2008).

II. TAXONOMICAL CLASSIFICATION

1) *Domain :* Eukaryota
2) *Kingdom:* Plantae
3) *Subkingdom:* Viridaeplantae
4) *Phylum:* Pinophyta
5) *Subphylum:* Euphyllophytina
6) *Infraphylum:* Radiatopses
7) *Class:* Pinopsida
8) *Order:* Pinales
9) *Family:* Cupressaceae
10) *Tribe:* Spiraeeae
11) *Genus:* Thuja
12) *Specific Epithet:* Occidentalis
13) *Botanical name: Thuja occidentalis*

III. MORPHOLOGY

Leaves are evergreen, scale-like, on main shoots, ¼" long with long points. Leaves are closely overlapping, successive pairs at right angles; upper and lower leaves flat, with a protruding resin gland, lateral leaves folded, clasping the flat leaves. Lateral shoots are flattened, 1/8 inch long with short points. Stem of the plant are Twiggy green and scale-like, turning brown, occurring in flattened foliar sprays. Fibrous, red-brown to gray bark with Diamond-shaped patterns are usually apparent. Flowers are Monoecious; solitary, females green with 4 to 6 scales; males are green tipped with brown and globose. They are having tiny, terminal, cone-like bodies. Male flowers are yellowish and arise from branchlets near the base of the shoot; female flowers are pinkish and appear at the tips of short terminal branchlets. Fruits are monoecious conifer with a narrow, almost columnar crown.

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IV. PHYTOCHEMISTRY

The fresh plant (associated to the dry substance) contains 2.07% reducing sugar, 4.9% water-soluble polysaccharides, 2.11% water-soluble minerals, 0.6% essential oil, 1.67% free acid and 1.31% tannic agents .The essential oil of the fresh leaves (correlated to the monoterpene fraction) contains 65% thujone, 8% isothujone, 8% fenchone, 5% sabines and 2% α-pinen as the main monoterpenes (Witte *et al.*1993). From the current study, further bioactive constituents have been found. High molecular weight glycoproteins/polysaccharides are highly pertinent for the activity of the plant (Kawai *et al.* 1994). According to Hansel *et al* (1994) the constituents of the dried herbal substance contains 1.4–4% essential oil, 60% of which is thujone, which corresponds to 2.4% thujone in the whole drug.

In spite of the broad phytochemical profile, the constituents of the essential oil are the characteristic metabolic group of the Thuja genus, being found in quite significant quantities in the species. Chang *et al.* (2000) cite various phytochemical studies that result in the isolation of various compounds, including diterpenes (dehydroabietane, neothujic acids III & IV), lignans [(-)-matairesinol, (-)-thujaplicatin methyl ether, (-)-wikstromol, epi-pinoresinol], monoterpenes (α-thujone, β-thujone, fenchone), and a sequiterpene alcohol [(+)-occidentalol]. Furthermore, in this same study, the authors isolated six substances, two of them brand new [(+)-7-oxo-13-epi-pimara-14,15-dien-18-oic acid (diterpene acid) and (+)-isopicrodeoxypodophilotoxina (lignan)] and four that had already been previously elucidated [(+)-7-oxo-13-epi-pimara-8,15-dien-18-oic acid, (+)-isopimaric, acid (-)-deoxypodophilotoxin and (-)-deoxypodorizone].

V. ANTIBACTERIAL ACTIVITY

The alcoholic extract of twigs of *Thuja occidentalis* was established for Antibacterial activity against both gram negative and gram positive organisms i.e., *Pseudomonas aeruginosa, Yersinia aldovae, Citrobacter, Shigella flexneri, E. coli* and *Staphylococcus aureu, Vernonia anthelmintica, Dryopteris chrysocoma and Trachyspermum ammi* were tested In vitro for their antibacterial and antifungal activities. The Antibacterial study was performed against six bacteria viz., *Escherichia coli, Citrobacter, Shigella flexenari, Yersinia aldovae, Staphylococcus aureus* and *Pseudomonas aeruginosa* indicated that had powerful activity against all microorganisms. The antifungal activity of these extracts was performed against six fungi, viz., *Saccharomyces cereviciae, Aspergillus parasiticus, Trichophyton rubrum, Macrophomina, Fusarium solani* and *Candida albicans.* The experiment showed significant results against different fungal strains (Jahan *et al.* 2010). In an experiment carried out by Castellón *et al.* (2000) with tinctures of *T. occidentalis* in a concentration of 65% ethanol, it was recorded that these were only active against strains of *S. aureus* and *Bacillus subtilis.*

A. Anti- cancer

From the previous study it has been found that, Crude ethanolic extract of *Thuja occidentalis* was used as homeopathic mother tincture (TOΦ) to treat various ailments, particularly moles and tumors, and also used in various other systems of traditional medicine. Anti-proliferative and apoptosis-inducing properties of TOΦ and the thujone-rich fraction (TRF) separated from it have been tested for their possible anti-cancer potentials in the malignant melanoma cell line A375 (Kumar et al. 2012).

B. Antiviral And Immune-Stimulant Activities

Previous studies and experimental in-vitro researches have shown the antiviral and immune-stimulant properties of the *in vitro* polysaccharides of *T. occidentalis* regarding inhibition of HIV and influenza Type A. Action on HIV cells has been previously reported by Gohla *et al* (1992), who meaningful out the ability of the high molecular weight polysaccharide fraction isolated from *T. occidentalis* (TPS) to inhibit HIV-1 at a concentration of 625 μg/mL without showing any toxicity towards MT-4 cells not infected by HIV-1. Later research found that, these activities were supported by other additional ones related to homeopathic *T. occidentalis*, namely: an increase in the release of nitric oxide (NO) *in vitro*, a reduction in the superoxide anion (O2-) *in vitro* by macrophages and an increase in bone marrow cells, such as CD3, CD45R and CD11(Oliveira, 2010).

C. Role In Treatment Of Respiratory Infections

It has been found that, the commercial preparation Esberitox®N (Aspen Australia), containing *Echinacea purpurea, Echinaceae pallida, Baptisia tinctoria* and *T. occidentalis*, presents in several clinical studies proven action for acute and chronic respiratory infection (viral or bacterial), including for children and as adjuvant antibiotics, in case of a serious bacterial infection (Zimmer, 1985).

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D. Role In Treatment Of Urethral Caruncle

The assessment activity was conducted to describe in prospective, longitudinal descriptive analytic, with group of 46 women diagnosed with urethral caruncle, which were followed from 2000 to 2005 using the homeopathic remedy *T. occidentalis* 12CH. Results showed that, the treatment improved the result of disappearance of the lesion before three weeks of treatment in 92.8% of patients (Arencibia et al. 2006).

E. Edible use of T. occidentalis

Now a day's in many country, *T. Occidentalis is* for edible purpose like soup, cooking and drinks. Pith of young shoots – cooked and it can be added to soups also. Pleasingly sweet, the pith was used as the basis of the soup according to one report by Facciola, 1990. Inner bark can also be cooked. It is only used in times of emergency or scarcity. The inner bark can be dried and ground into a powder, then used with wheat or other cereals in making bread, biscuits etc (Weiner, 1980). The leafy branchlets are used as a tea substitute, but are probably best avoided by pregnant women. Another report says that the foliage and bark are used; the resulting tea is a good source of vitamin C (Lauriault, 1989).

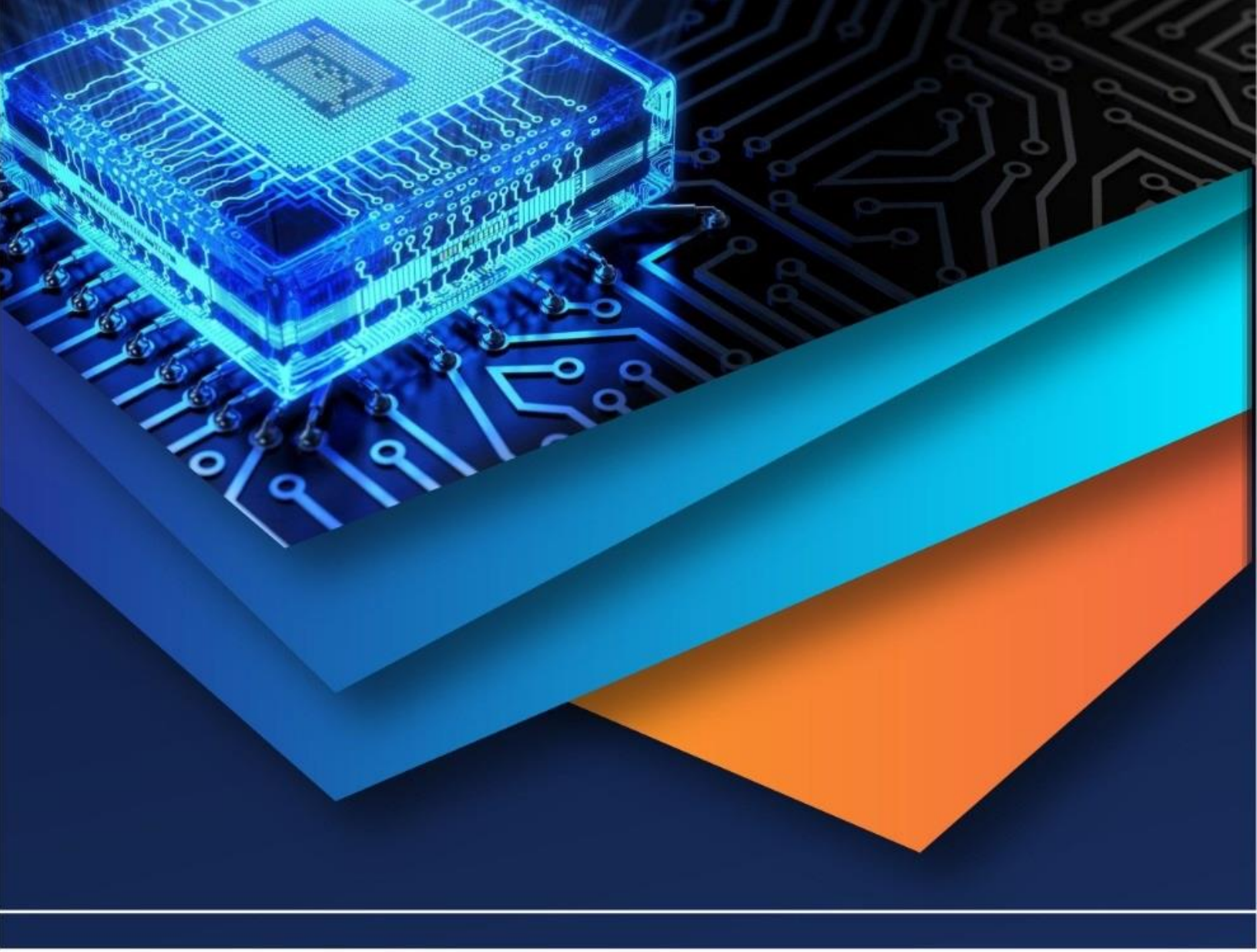
VI. CONCLUSION

The present review reveals that the plant *Thuja occidentalis* is found to have therapeutic uses in treating various ailments and also in culinary purpose. A detailed research work in the characterization and standardization is strongly required for this potential plant in developing its various formulations, which can ultimately be beneficial for humans as well as animals. This plant is commonly available in our vicinity, where we use them for garden and place decoration as landscaping plant.

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