International Journal of Advanced Scientific Research
ISSN: 2456-0421; Impact Factor: RJIF 5.32
www.allscientificjournal.com
Volume 1; Issue 9; October 2016; Page No. 06-07

Pharmacognosy and phytochemistry of *Thuja occidentalis* Linn

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Abstract
The traditional system of medicine plays a significant role in our health care system for the treatment of mankind. Thuja occidentalis is commonly used herb in Ayurvedic medicine. Thuja occidentalis (Northern white cedar) belongs to the family Cupressacae. The plant is highly used by rural people in curing various disorders. Thuja occidentalis has an effective natural origin that has a tremendous future for research as the novelty and applicability of Thuja occidentalis are still hidden. Such things can be overcome through modern scientific research. The present article describes various traditional and medicinal utility of the chemical composition and pharmacological activity of the plant and its constituents.

Keywords: *Thuja occidentalis*; traditional uses; phytochemistry; pharmacognosy

1. Introduction

***Thuja occidentalis* Linn.**

Family Cupressaceae

Common Name: Northern white-cedar, thuier cedre, cedre-thuya occidental, eastern whitecedar, American or eastern arborvitae (www. arhomeandgarden.org).

Thuja is the greek name for "Juniper", another common evergreen shrub or tree and *occidentalis* translates as "western", referring to it being native to the Western Hemisphere.

1.1 Taxonomical Classification

Kingdom	:	Plantae
Division	:	Pinophyta
Class	:	Pinopsida
Order	:	Pinales
Family	:	Cupresseaceae
Subfamily	:	Cupressoideae
Genus	:	*Thuja*
Species	:	*occidentalis*

Fig 1

The Northern White Cedar is a monoecious conifer attaining a height of 15-38 m, tending to be stunted or prostrate in harsh, frigid environments. Occasionally the trunk is divided into two to three secondary stems, often reproducing from fallen trunks. The bark is reddish or grayish brown, 6-9 mm thick, fibrous, and fissured. The leaves of the branchlets are 1.5 to 3.5 mm in length, acute, dull yellowish green on both surfaces. The pollen cones are of 1-2 mm in reddish colour, the seed cones ellipsoid, 9-14 mm in length and brown in colour (Gilman and Watson, 1994) [1].

1.2 Species

- *Thuja koraiensis* - Korean Thuja
- *Thuja occidentalis* - Eastern Arborvitae, Northern White cedar
- *Thuja plicata* - Western Red cedar
- *Thuja standishii* - Japanese Thuja
- *Thuja sutchuenensis* - Sichuan Thuja

1.3 Habitat

Thuja occidentalis grows naturally in wet forests, being particularly abundant in coniferous swamps. Although not currently listed as endangered, wild *Thuja occidentalis* populations are threatened in many areas by high deer numbers because they find the soft evergreen foliage a very attractive winter food, and strip it rapidly. The largest known specimen is 34 m tall and 175 cm diameter, in South Manitou Island within Leelanau County, Michigan.

It can be a very long-lived tree in certain conditions, with notably old specimen growing on cliffs where they are inaccessible to deer and wildfire; the oldest known living specimen is just over 1,100 years old, but a dead specimen with over 1,650 growth rings has been found. These very old trees are, despite their age, small and stunted due to the difficult growing conditions. The Witch Tree, a *T. occidentalis* growing out of a cliff face on Lake Superior in Minnesota, was described by a French explorer as being a mature tree in 1731 and is still alive today (www. arhomeandgarden.org).

1.4 Geographical distribution

Canada: Manitoba, Ontario, Quebec; Prince Edward Island, New Brunswick, Nova Scotia; USA: Minnesota, Michigan, Wisconsin, Illinois, Indiana, Ohio, Kentucky, Tennessee, North Carolina, Virginia, West Virginia, Maryland, Pennsylvania,

New York, Connecticut, Massachusetts, Vermont, New Hampshire, Maine; at 0-900 m elevation on mostly calcareous substrates, neutral to basic swamps, shores of lakes and rivers, uplands, cliffs, and talus. Isolated stands occur north and east of its general range in Canada (to 51° 31' N latitude in Ontario, 50° N in Quebec). In the United States south of the Great Lakes and in southern New England, it occurs locally in scattered stands (www. arhomeandgarden.org).

1.5 Chemical constituents

Thuja occidentalis fresh leaves contains essential oils that is 65% thujone, 8% isothujone, 8% fenchone, 5% sabines and 2% α-pinene as the main monoterpenes (Belal, 2008) [3].

The highest content of essential oil was found in extracts obtained by distillation, whilst percolation with purified water reduced the thujone content in the extract to the lowest level. Using purified water as a solvent, an average of 0.6 mg of thujone was extracted from 1 g of drug during percolation. In contrast, when 30% (v/v) ethanol was used, 2.8 mg of thujone was extracted from 1 g of Thuja occidentalis herba, and >2.5-fold higher amounts of thujone (7.9 mg) were attained with high ethanol concentration (90% v/v) (Kumar *et al*. 2012) [6].

Uses: *Thuja occidentalis* has astringent, vermifuge, tonic, anti-inflammatory, stimulant, anti-oxidant, antibacterial, antifungal, anti-oxidant, hepatoprotective and many other uses.

Toxicity/ side effects: It is abortifacient, so it cannot be used during pregnancy, and when given in large doses, it causes gastrointestinal problems (Felter, 1904) [4].

Substitutes/ adulterants: *Thuja orientalis*.

2. Conclusion

A detailed research work in the characterization and standardization is strongly required for this potential plant in developing its various formulations, which can ultimetly be beneficial for humans as well as animals. Further studies are warranted to explore much depth about this plant known by the name "The tree of life".

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