PHYTOCHEMICAL INVESTIGATION AND PHARMACOLOGICAL SCREENING OF PLATYCLADUS ORIENTALIS

* Alok Kumar Dash 1 Jhansee Mishra 1 Dr.Deepak Kumar Dash 2

1 Department of Pharmacy, Suresh Gyan vihar university, jaipur, India 302025
2 Principal Rayal college of Pharmacy Science, Raipur, Chattishgarh, India

Corresponding Author - Alok Kumar Dash, Research scholar Department of Pharmacy, Suresh Gyan vihar university, jaipur, India 302025

ABSTRACT:
In ayurveda, plants have been used for the treatment of so many diseases. Herbal drugs are easily available and have fewer side effects. So, many people are attracted towards the herbal drugs. Platycladus orientalis is one of the useful plant in Indian & Chinese medicine. It is used in treatment of so many diseases like diuretic, anticancer, anticonvulsant, stomachic, antipyretic, analgesic and anthelmintic etc. In Zimbabwe, Mozambique and South Africa Platycladus orientalis is grown as an ornamental. The essential oils extracted from leaves, cones and wood are important in body care products used in the Western world.

Platycladus 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 treatment of bronchial catarrh, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea and rheumatism. Recent re-searches in different parts of the world have shown that p. orientalis and its active component thujone have the great potential against a various health problems.

Key words : medicinal plant , platycladus orientalis Linn, phytochemical constituents, traditional uses

INTRODUCTION
Natural products are important sources for biologically active drugs. India is a heritable emporium of many medicinal and aromatic plants (1). It has one of the oldest, richest and most diverse cultural traditions associated with use of medicinal plants. The classical Indian Literature, The Vedas, which are more than 3000 years old, mention the use of medicinal and aromatic herbs, shrubs and flowers in treating various diseases. As improvements in analysis and quality control along with advances in clinical research show the value of herbal medicine in the treating and preventing disease. According to the ayurveda, plants have so many constituents which may be used for the treatment of diseases. (2) Herbs had been used by all cultures throughout history but India has one of the oldest, richest and most diverse cultural living traditions associated with the use of medicinal plants. (3) The natural distribution of Platycladus orientalis is obscured by its long history of cultivation in large parts of Asia. It is assumed to have originated from northern and north-eastern China, Korea and Siberia. (4) Its distribution has extended to Japan, Taiwan and Central Asia, and it is locally naturalized in Indo-China. It has been cultivated in Europe since the first half of the 18\textsuperscript{th} century. In cooler areas of tropical Africa it has been planted primarily as an ornamental.
2.1- PLANT PROFIL

2.1.1: Botanical Name: *Platycladus orientalis* (L) Franco

Family: Cupressaceae
Synonym: *Biota orientalis* (L.) Endl. *Thuja orientalis* L.
Taxonomy Domain: Eukaryota
Kingdom: Plantae
Subkingdom: Viridaeplantae
Phylum: Tracheophyta
Subphylum: Euphylllophytina
Infraphylum: Radiatopses
Class: Pinopsida
Order: Pinales
Family: Cupressaceae
Tribe: Diapensieae
Genus: Platycladus
Specific epithet: orientalis
Botanical name: Platycladus orientalis

Members of the genus Platycladus: 55 species, subspecies, varieties, forms, and cultivars in this genus:

1. *P. orientalis* (Oriental Arbor-Vitae) ·
2. *P. orientalis* 'Aurea' ·
3. *P. orientalis* (L.) Franco 'Arthrotaxoides' · etc…. 
2.2. CHEMICAL CONSTITUENTS:
Thuja orientalis leaves contain rhodoxanthin, amentoflavone, hinokiflavone, quercetin, myricetin, carotene, xanthophylls and ascorbic acid. (5) The fruit and roots are strongly aromatic. Distillation of the dried roots yields an essential oil having the following properties: Sp.gr. 200, 0.971 [α]D, -22.50 nD20, 1.5055: acid val. 2.1 ester. Val. 26.27; ester. Val. After acetylation, 89.39; Carbons (as C10H16O), 5.65% and 50% in 7-8 vols of 95% alcohol (6). The composition of the oil is as follows: a new bicyclic sesquiterpene 51.10; 1-borneol, 17.10; bornyl acetate, 9.1; α-thujone and camphor, 5.6; and a new sesquiterpenenic alcohol. The seed yields fatty oil having the fallowing composition palmitic 5.28, stearic, 7.3; C18 unsaturated acids, 1829 (linolenic, 44.6%); and C20 un-saturated acids, 6.10%. The heartwood contains aromadendrin, taxifolin, widdrene, cedrol, thujiopsadiene, dehydro-α-curcumene, β-isobiotol and Curcumeneether. It also contans an essential oil C is a complex blend of: Sesquiterpene hydrocarbons (cuparenes) 40; alcohols (Cedrol, widdrol, cuparenols) 50; monoterpenic acids (7). Nickavar et al., (8) 19 and 28 compounds have been identified in the volatile oils of the fruit and leaf, respectively, while 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 monoterpen that occurs naturally in two diastereomeric forms: α-thujone and β- thujone(9,10).

MATERIALS AND METHODS
3.1. Plant collection
Leaves of *Platycladus orientalis* were collected in the month of November 2011 from its natural habitat from nearby Dasapalla forest division, Nayagarh district of Odisha, India. The plant was authenticated from T.D P.G College, Jaunpur by Dr. A.K. Singh, the HOD of Botany. The leaves were cleaned and dried under the shade to avoid degradation of volatile oil.

3.2. Extraction
The dried leaves were coarsely powdered and extracted with petroleum ether and water by a Soxhlet apparatus at 50°C. The solvent was completely removed and obtained dried crude extract which was used for investigation. Further the extracts were subjected for the phytochemical study as well as pharmacological screening.

2.3. Phytochemical screening
Phytochemical screenings were performed using standard procedures. (11,12,13,14)
1) *Test for alkaloids*:.
a) Mayer’s test: b) Dragendorff’s test c) Hager’s test:
2) *Test for carbohydrates and reducing sugar*:
a) Molisch’s test: b) Fehling’s test: c) Benedict’ s test: d) Barfoed’s test:
3) *Test for steroids*: Libermannburchard’s test:
4) *Test for proteins*: a) Biuret test: b) Millon’s test:
5) *Test for tannins*:
6) *Test for phenolic compounds*:
7) *Test for flavonoids*: a) Shinoda’s test:
8) *Test for gums and mucilage*:
9) *Test for glycosides*:
10) Test for saponins: Foam test. Etc...

Results of qualitative phytochemical screening of various extracts of Platycladus Orientalis

<table>
<thead>
<tr>
<th>PLANT CONSTITUENTS</th>
<th>TEST/REAGENT USED</th>
<th>PETROLEUM ETHER EXTRACT</th>
<th>AQUEOUS EXTRACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEST FOR CARBOHYDRATES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molisch’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Fehling’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Benedict’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Barfoed’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Test for Starch</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR GUMS &amp; MUCILAGE</strong></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR PROTINS &amp; AMINO ACIDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ninhydrin Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Biuret Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Millon’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Xanthoproteic Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Tannic Acid (10% w/v)</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>With Heavy Metals</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Heller’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Adam Kiewicz’s Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Iodine Test</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR FIXED OILS &amp; FATS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spot Test</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR ALKALOIDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dragendroff’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Mayer’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Wagner’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Hager’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Phosphomolybdic Acid</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Tannic Acid</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR GLYCOSIDES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Baljet’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Borntrager’s Test.</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Keller-Killiani’s Test</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Test for Cyanogenetic Glycosides</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR PHYTOSTEROLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liebermann-Burchard’s Test</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Salkowski’s Test</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td><strong>TEST FOR FLAVONOIDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
FeCl$_3$ Test  +  +  
Shinoda’s Test  +  +  
Fluorescence Test  +  +  

**TEST FOR TANNINS AND PHENOLIC COMPOUNDS**

<table>
<thead>
<tr>
<th>Reaction</th>
<th>+</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FeCl$_3$ solution</strong></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Reaction with copper sulphate</strong></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Reaction with lead acetate</strong></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Reaction with Potassium dichromate</strong></td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Drug + K$_3$Fe(CN)$_6$ + NH$_3$</strong></td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**TEST FOR SAPONONS**

Foam Test  –  +  

+ = presence, – = absence

**PHARMACOLOGICAL SCREENING**

**Platycladus orientalis** posses various pharmaceutical application. Researcher found many pharmacological application of platycladus orientalis which are in the following way.

**Research updates on Platycladus orientalis**

**Salma and Amal Mohamed(2006)** isolate the volatile oil from *Platycladus orientalis* fruits and evaluate its cytotoxicity against five human tumor cell lines. There is a very potent cytotoxic activity of the oil against all tested human cell lines. The oil had also a significant antimicrobial activity and a moderate antifungal activity.

**Feng and Han(2009)** shows the Possible effect of solar activity on variation of the tree-rings of a 500 platycladus orientalis at the Mausoleum of Emperor Huang. They apply the wavelet power spectrum analysis method to study the SSN and cyclical changes of the tree-rings of the cypress at MEH, in order to pro-vide the further evidences for studying the relationship between the climatic change and solar activity.

**Magda et al.(2004)** shows The hydrodistilled essential oils of the fresh fruits and leaves of *Thuja orientalis* L. Syn. *Biota orientalis* (L.) Endl (*Platycladus orientalis* L.)Family: *Cupressaceae* were subjected to GC and GC/MS analysis. Twenty-four and twenty-one compounds had been identified in the essential oils of fruits and leaves respectively.

**Jafarian et al.(2004)** possess Isolation and identification of some potent anti-tumor compounds from medicinal plants, has motivated researchers to screen different parts of plant species for anti-tumor effects. It has been reported that several conifers posses cytotoxic activities on some human tumor cell lines.

**Amit et al.(2011)** found that Alcoholic extract produced significant antipyretic activity (p < 0.05). In general, non-steroidal anti-inflammatory drugs produce their antipyretic action through the inhibition of prostaglandin synthetase within the hypothalamus. Therefore, the antipyretic activity of alcoholic extract of *Platycladus Orientalis* is probably by inhibition of prostaglandin synthesis in hypothalamus.
Amit et al (2011) investigation that the butanol extract of P. Oriantalis showed dose dependent antidiarrhoeal activity in various validated models in rats and the extractive value of P. Oriantalis leave in n-Hexane (7.5%), Chloroform (15.35%) in butanol (29.2%) and in aq. Portion (55.10%). The preliminary phytochemical studies on the BPE demonstrate the presence of alkaloids, flavonoids, glycosides, tannins, saponins, steroids and triterpenoids.

Niranjan et al (2010) found that ethanol extract from the leaves of Platycladus orientalis were investigated for their anthelmintic activity against Pheretima posthuma. Three concentrations (1%, 2.5% and 5%) of extract were studied in activity, which involved the determination of time of paralysis and death of the worm. The extract exhibited significant dose dependent anthelmintic activity.

Dong et al (2007) study on the interspecific association of main undergrowth in the community of Platycladus orientalis. He found a series of parameters for the interspecific association of dominant undergrowth in Platycladus orientalis community, including the importance value, collectivity variance ratio.

Afsharipoor et al (2000) study of the flavour profiles of the fruits and terminal branchlets of platycladus orientalis. Here Eighty components were identified in the investigated essential oils. The essential oil obtained from the branchlets of this plant contained 21 monoterpenoids, 28 sesquiterpenoids and 3 diterpenoids, while the essential oil of the fruits contained 27 monoterpenoids, 12 sesquiterpenoids and 3 diterpenoids.

LI Yuan et al (2008) investigate the Antifungal Activity of Ethanol Extract from Platycladus orientalis. He observed the ethanol extract of leaves, branchlets cones and seeds had antifungal activities and the antifungal activity of leaves extract was the best; the inhibition composition was in the petroleum ether and ethyl acetate extracts.

Emami et al (2007) found Antioxidant Activity of Leaves and Fruits of Iranian Conifers. Cupressus semipervirens var. horizontalis, Cupressus semipervirens var. semipervirens, Cupressus semipervirens cv. Cereiformis, Juniperus communis subsp. hemisphaerica, Juniperus excelsa subsp. excelsa, Juniperus excelsa subsp. polycarpus, Juniperus foetidissima, Juniperus oblonga, Juniperus sabina, Platycladus orientalis and Taxus baccata are Iranian conifers.

Zhang et al (2007) In order to offer a scientific basis for cultivation and management of forests, effects of light radiation intensity on photosynthetic characteristics and water use efficiency of Platycladus orientalis he investigate Effects of light radiation intensity on photosynthetic characteristics and water use efficiency of Platycladus orientalis and Pinus tabulaeformis seedlings.


Seyed et al (2011) investigate chemical constituents and toxicity of essential oils of oriental arborvitae, platycladus orientalis (l.) franco, against three stored-product beetles. This study
demonstrated that the essential oil from the leaf of *P. orientalis* was more toxic than the fruit oil on *C. maculatus*, *S. oryzae*, and *T. castaneum*

*Lai et al* (1994) *Found* Dietary Platycladus orientalis seed oil suppresses anti-erythrocyte autoantibodies and prolongs survival of NZB mice. He observed diets containing the oil of Platycladus orientalis containing 3% 5,11,14-ETA, a matched control oil, fish oil, or safflower oil were fed to NZB mice. There was a dramatic delay in both the onset and the titer of direct Coombs' tests in mice fed P. orientalis oil.

*Wang et al* (2011) *observed* the genetic diversity of eighteen Platycladus orientalis provenances from seventeen provinces was analyzed by AFLP markers. Eight primers produced a total of 1 613 polymorphic bands(92.19%).The average effective number of alleles, Neis gene diversity and Shannons information index were 1.199 3, 0.123 9 and 0.194 9,respectively, indicating that there was plentiful genetic diversity among the provenances of P. orientalis.

*Asili et al* (2004) *Identify* the Labdanes and isopimaranes from Platycladus orientalis and their effects on erythrocyte membrane and on Plasmodium falciparum growth in the erythrocyte host cells. Six labdanes (1-6) and four isopimaranes (7-10), including three new natural products (7, 9, and 10), were isolated from Platycladus orientalis, and their structures determined using 1D and 2D NMR methods, ion-cyclotron resonance HRMS, and optical rotation data

*Kim et al* (1910) *studied* Thuja orientalis (TO) has been a recognized herbal medicine across Northeast Asian countries for thousands of years and used for the treatment of various inflammatory diseases through as yet undefined mechanisms. In this study, we set out to determine whether the anti-inflammatory effects of this plant are mediated to suppress mitogen-activated protein kinases (MAPKs) and nuclear factor-κB (NF-κB) activation in lipopolysaccharide (LPS)-stimulated RAW 264.7 cells.

*Ming et al* (2007) *studied* photosynthesis and water use efficiency of *platycladus orientalis* and *robinia pseudoacacia* saplings under steady soil water stress during different stages of their annual growth period

*Bahman et al* (2003) *found* that the fruit oil of *T. orientalis* was characterized by the very high contents of α-pinene, the low contents of α-cedrol and the presence of _- phellandrene, whereas the leaf oil of *T. orientalis* was characterized by the high contents of α-pinene and α-cedrol and the presence of limonene

*Emami et al* (2011) *Found* the antioxidant effects of the essential oils from the fruit and leaves of *Platycladus orientalis* Franco (Cupressaceae) were studied. Accordingly, their ability to inhibit (i) LDL oxidation, (ii) red blood cells hemolysis, (iii) insulin and hemoglobin glycosylation, and (iv) linoleic acid peroxidation were assessed. The results showed that (a) the antioxidant effect of the leaf oil was significantly higher than the fruit oil in all oxidative systems employed in the present investigation, except LDL oxidation, (b) a greater effect was observed in glycosylation system with more than 60% antioxidant properties, and (c) in linoleic acid peroxidation system, a greater antioxidant effect was observed after 2 h incubation (about 45%).
Priya et al(2012) shown that T. orientalis and its active component thujone have the great potential against a various health problems. T. 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 be also used as insecticidal, molluscicidal and nematicidal activity against different pests. The present review highlights the some important biological properties of T. orientalis.

CONCLUSION-
It can be concluded from the ongoing literature that T. orientalis has the great potential against a number of health problem viz. bacterial, fungal and worm infection. It has antioxidant, antiviral, insecticidal nematicidal and molluscicidal activity. Recently, it has shown antidiabetic and hepatoprotective property. It needs greater attention by the researchers to explore its full potential and efficient use in the human welfare.

REFERENCE
15-Salma Ahmed El Sawi and Amal Mohamed Alihave reported Chemical and biological investigation of fruit volatile oil of the Egyptian Platycladus orientalis
16-Bo Feng and YanBen Han have reported Possible effect of solar activity on variation of the tree-rings of a 500 Platycladus orientalis.
17. Li Yuan-yuan, Hao Shuang-hong, Wan Da-wei, LI Jian-yan, Sun Wei-uang, Meng Zhao-li have reported Antifungal Activity of Ethanol Extract from Platycladus orientalis.
18. Wang Xian-kun, Zhang Xiao-hua, Hao Shuang-hong have studied Isolation, Identification and Antifungal Activity Screening of Endophytic Fungus from *Platycladus orientalis*
19. Wu Xiaming have reported Geographic Variation of *Platycladus orientalis*(L) Franco
20. S Afsharipoor, S.A Emami have report on Study of the flavour profiles of the fruits and terminal branchlets of *platycladus orientalis* (l.) franco.
21. B. Nickavar et al. have reported Volatile Constituents of the Fruit and Leaf Oils of *Thuja orientalis* L. Grown in Iran
23. FENG Bo & HAN YanBen *Sci China Ser G-Phys Mech Astron* | Apr. 2009 | vol. 52 | no. 4 | 631-639