

A comparative study on phytochemical investigation and pharmacological screening of *Platycladus orientalis* and *Ocimum canum* with review of literature

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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, amenorrhoea and rheumatism. Recent re-researches 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

The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. In traditional systems of medicine, different parts (leaves, stem, flower, root, seeds and even whole plant) of *Ocimum canum* Linn (known as kala Tulsi in Hindi), a small herb seen throughout India, have been recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases, arthritis, painful eye diseases, chronic fever, insect bite etc. The *Ocimum canum* L. has also been suggested to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, hepatoprotective, cardioprotective, antiemetic, antispasmodic, analgesic, adaptogenic and diaphoretic actions.

Keywords: *Eclipta Prostrata* (L.)L – Anti-hepatotoxic activity, luteolin, wedelolactone, β -amyirin

1. 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, mentioned 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.[3,4] 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. 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 18th century. In cooler areas of tropical Africa it has been planted primarily as an ornamental.

1.1- Plant Profile of *Platycladus orientalis*

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

Family: Cupressaceae

Synonym: *Biota orientalis* (L.) Endl. *Thuja orientalis* L.

Taxonomy Domain: *Eukaryota*

Kingdom: *Plantae*

Subkingdom: *Viridiaeplantae*

Phylum: *Tracheophyta*

Subphylum: *Euphyllophytina*

Infraphylum: *Radiatopses*

Class: *Pinopsida*

Order: *Pinales*

Family: *Cupressaceae*

Tribe: *Diapensiaceae*

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....

1.2 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; Carbonyls (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; l-borneol, 17.10; bornyl acetate, 9.1; α -thujone and camphor, 5.6; and a new sesquiterpenic alcohol. The seed yields fatty oil having the following 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, thujopsadiene, dehydro- α -curcumene, β -isobiotol and Curcumenether. It also contains an essential oil C is a complex blend of: Sesquiterpene hydrocarbons (cuparenes) 40; alcohols (Cedrol, widdrol, cuparenols) 50; monoterpene 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 monoterpene that occurs naturally in two diastereomeric forms: α -thujone and β -thujone [9,10].

2.1- Plant Profile of *Ocimum canum* L [46,47]

Botanical Name: *Ocimum canum* L,

Family Name: Lamiaceae

Synonym: Manjari, wild basli

Taxonomy: Kingdom - *Plantae* – Plants

Subkingdom: *Tracheobionta* – Vascular plants,

Superdivision: *Spermatophyta* – Seed plants

Division: Magnoliophyta – Flowering plants .,

Class: Magnoliopsida – Dicotyledons

Subclass: Asteridae, Order- Lamiales

Genus: *Ocimum L.* R--bsali.

Species: *Ocimum canum* Sims, hoary basli

Vernacular name - Hindi- Kali tulsi, English- Holi tulsi

2. Material and metods

2.1. 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.

2.2. Phytochemical Screening

Phytochemical screenings were performed using standard procedures. [11-14]

1) Test for alkaloids:

a) Mayer’s test: b) Dragendroff’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: Libermann burchard’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...

3. Result

Table 1: Phytochemical analysis of *Platyclusus Orientalis*[15]

Plant Constituents test/reagent used	Petroleum ether Extract	Aqueous Extract
Test for Carbohydrates	-	+
Test for gums & mucilage	+	+
Test for protins & amino acids	-	+
Test for fixed oils & fats	-	-
Spot Test	+	+
Test for alkaloids	-	-
Test for Glycosides	-	-
Test for Phytosterols	+	+
Test for Flavonoids	+	+
Test for Tannins and Phenolic compounds	+	+
Test for Saponons	-	++

Table 2: Phytochemical analysis of *Ocimum canum* leaves [49,50]

S. No	Phytoconstituents	Petroleum ether Extract	Aqueous Extract
1	Alkaloids	-	-
2	Carbohydrates	+	+
3	Glycosides	-	-
4	Phtyosterols	-	-
5	Fixed oils	-	-
6	Saponins	-	-
7	Tannins	+	+
8	Protein and amino acids	-	-
9	Gums and mucilage	-	-
10	Flavonoids	+	+
11	Terpenoids	+	+

4. Pharmacological Screening

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

4.1 Research updates on *Platycladus orientalis*

Salma and Amal Mohamed 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 [15].

Feng and Han show 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.[16]

Magda *et al* 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.[17]

Deepak Dash *et al* aqueous extract of the leaves of *Ocimum canum* has antidiabetic and antihyperlipidaemic effects. Since the phytochemical analysis has shown the presence of potent phytochemicals like flavonoids, terpenoids, tannins, carbohydrate and phenols.[18]

Alok *et al* found that the aqueous extract of *P. orientalis* exhibits anti hyperglycemic, in addition to antihyperlipidemic and antioxidant effects in STZ-induced diabetic rats. It also concludes that by thorough analytical work, isolation through HPLC techniques and pectroscopic techniques such as NMR & IR it was justified that the phytoconstituent which were responsible for the pharmacological action was present in the aqueous extract of *P. orientalis*. [19]

Amit *et al* investigation that the butanol extract of *P. Orientalis* showed dose dependent antidiarrhoeal activity in various validated models in rats and the extractive value of *P. Orientalis* 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.[20]

Niranjan *et al* 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 [21].

Dong *et al* study on the interspecific association of main undergrowth in the community of *Platycladus orientalis*. He founf a series of parameters for the interspecific association of dominant undergrowth in *Platycladus orientalis* community, including the importance value, collectivity variance ratio [22].

Afsharipoor *et al* 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 contianed 27 monoterpenoids, 12 sesquiterpenoids and 3 diterpenoids.[23]

Liyuan *et al* 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.[24]

Emami *et al* found Antioxidant Activity of Leaves and Fruits of Iranian Conifers. *Cupressus semipervirens* var. *horizontalis*, *Cupressus semipervirens* var. *semipervirens*, *Cupressus semipervirens* cv. *Cereifeormis*, *Juniperus communis* subsp. *hemisphaerica*, *Juniperus excelsa* subsp. *excelsa*, *Juniperus excelsa* subsp. *polycarpos*, *Juniperus foetidissima*, *Juniperus oblonga*, *Juniperus sabina*, *Platycladus orientalis* and *Taxus baccata* are Iranian conifers [25].

Zhang *et al* 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 [26].

Soheil *et al* Search for novel antifungals from 49 indigenous medicinal plants: *Foeniculum vulgare* and *Platycladus orientalis* as strong inhibitors of a flatoxin production by *Aspergillus parasiticus*[27].

Seyed *et al* 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*[28].

Lai *et al* 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.[29]

Wang *et al* 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*.[30]

Asili *et al* 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 [31].

Kim *et al* 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- κ B (NF- κ B) activation in lipopolysaccharide (LPS)-stimulated RAW 264.7 cells.[32]

Ming *et al* 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 [33].

Bahman *et al* 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[34]

Emami *et al* 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. [35]

Dash *et al* shown that *Thuja orientalis* (PE) extract shows significant protection against thioacetamide-induced toxicity by its ability to ameliorate the lipid peroxidation through the free radicals scavenging activity. [36]

5. Importance of natural product with focus to *Ocimum canum*

Natural products are important sources for biologically active drugs [37]. There has been an increasing interest in the medicinal plants as natural products in different parts of the world [38]. Medicinal plants containing high antioxidant properties play an important role in the prevention of various degenerative diseases in the society. The medicinal value of these plants depends on bioactive phytochemical constituent's action in the human body. Some of the most important bioactive phytochemical constituents include alkaloids, flavonoids, essential oils, tannins and saponins[39]. Phenolics are commonly found in medicinal plants and their biological effects, include antioxidant activity. Due to synthetic antioxidants such as butylated hydroxyl anisole (BHA), butylated hydroxyl toluene (BHT), and tert-butyl hydroquinone (TBHQ), which are widely used in food industry and cosmetic, have been growing concern over the possible carcinogenic effects [40]. According to Dash et.al *Ocimum canum* extract supplementation is beneficial in controlling the blood glucose level, improves the lipid metabolism and prevents diabetic complications from lipid peroxidation and antioxidant systems in experimental diabetic rats. This could be useful for prevention or early treatment of diabetic disorders. [41]. Natural antioxidants from plant sources are potent and safe due to their harmless nature; wild herbs have their antioxidant properties. Tulsi, the Queen of herbs, the legendary 'Incomparable one' of India, is one of the holiest and most cherished of the many healing and healthy giving herbs of the orient. The sacred Tulsi, is renowned for its religious and spiritual sanctity, as well as for its important role in the traditional Ayurvedic and Unani system of holistic health and herbal medicine of the East. It is

mentioned by Charaka in the Charaka Samhita; an Ayurvedic text. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability [42]. Because of these advantages the medicinal plants have been widely used by the traditional medical practitioners in their day to day practice. According to a survey (1993) of World Health Organization (WHO), the practitioners of traditional system of medicine treat about 80% of patients in India, 85% in Burma and 90% in Bangladesh [43]. Plants found in various part of eastern Uttarpradesh play a vital role for the treatment of diabetic and for the betterment of humanbeings. Diabetes is a metabolic disorder which can be considered as a major cause of high economic loss which can in turn impede the development of nations [44]. In traditional systems of medicine the Indian medicinal plants have been used in successful management of various disease conditions like bronchial asthma, chronic fever, cold,cough, malaria, dysentery, convulsions, diabetes, diarrhea, arthritis, emetic syndrome, skin diseases, insect bite etc and in treatment of gastric, hepatic, cardiovascular & immunological disorders[45].

6. Pharmaceutical Application of Ocimum [51-53]

Healing power: The tulsi plants have many medicinal properties .The leaves are used as nervine tonic and also enhance memory power .They promote the removal of the catarrhal matter and phlegm from the bronchial tube. The leaves strengthen the stomach and induce copious preparation. The seed of the plant are mucilaginous.

Skin Disorders: Applied locally, ocimum juice is beneficial in the treatment of skin diseases. It has also been tried successfully by some naturopathy in the treatment of leucoderma.

Coughs: Tulsi is an important herbal drug used as cough syrup and expectorant. It helps to mobilize mucus in bronchitis and asthma. Chewing tulsi leaves relieves cold.

Sore throat: Water boiled with ocimum leaves can be taken as drink in case of sore throat. This water can also be used as a gargle.

Respiratory Disorder: The herb is useful in the treatment of respiratory disorder. A decoction of leaves with honey and ginger is an effective remedy for bronchitis, asthma, influenza, cough and cold, decoction of leaves, cloves and common salt also gives immediate relief in case of influenza. They should be boiled in little quantity of water and then taken.

Kidney stone: Ocimum has strengthening effect on the kidney. In case of renal stone the juice of ocimum leaves and honey ,If taken regularly for 6 months it will expel stones via the urinary tract.

Heart disorder: *Ocimum canum* has beneficial effect in cardiac disease and the weakness resulting from them. It reduces the of blood cholesterol. Common pediatric problems like cough, cold, fever diarrhea and vomiting respond favorably to the juice of basil leaves, If pustules of chicken pox delay their appearance, ocimum leaves taken with saffron will hasten them.

Stress: Ocimum canum leaves are regarded as an adeptogen or anti stress agent. Recent studies have shown that the leaves afford significant protection against stress. Even healthy person can chew 12 leaves of ocimum, two a day, to prevent stress. It purifies blood and helps prevent several common ailments.

Mouth infection: The leaves are quite effective for the ulcer and infection in the mouth. A few leaves chewed will cure these elements.

Insect bites: The herb is a prophylactic or preventive and curative for insect stings or bites. A tea spoonful of Fresh leaves juice may be applied to the affected parts, a paste of fresh root is also effective in case of bites of insects.

Teeth disorder: The herb is useful in teeth disorder. The dried leaves powder can be used for brushing teeth. It can also be mixed with mustered oil to make a paste and used as toothpaste. This is a very good herbal drug for maintaining dental health, counteracting bad breath and for massaging the gum. It is also useful in pyorrhea and other teeth diseases.

Headaches: Ocimum is a good medicine for headache. The decoction of the leaves can be given for this disorder. Powder leaves mixed with sandal wood paste can also be applied on the forehead for getting relief from headache. Ocimum juice is an effective remedy for sore eye and night-blindness, which is generally caused by deficiency of vitamin. Two drops of black basil juice are put into the eye daily at bed time.

Anti cancer activity: The anti cancer activity of ocimum has been proved. The alcoholic extract (ALE) OF leaves of ocimum has a modulatory influence on carcinogen metabolizing enzyme such as cytochrome P450, Cytochrom b aryle hydrocarbon, hydroxylase and glutathione S-transferase (gst), which are important in detoxification of

carcinogen and mutagen. The anti cancer activity of oimum has been reported against human fibrosarcoma cells culture.

Lipid lowering activity: Fresh oimum leaves causes significance change in the lipid profile of normal albino rat. This results significant lowering in serum total cholesterol triglycerides, phosholipid LDP Cholestrol.

Anti malarial effect: Essential oil of ocimum has been reported to possess 100% larvicidal activity against the culex mosquitoes. Ocimum have excellent anti malarial activity.

Anti allergic and immunomodulatory effect: Essential oil of ocimum was found to have anti allergic properties. When administered to laboratory animal, the ocimum was found to inhibit mast cell degranulation and histamine release in the presence of allergen. These studies reveal the potential role of ocimum canum extracted in the management of immunological disorder including allergic and asthma.

Anti fertility effects: One of the major constituents of the leaves, urosolic acid possess anti fertility activity in rats and mice. This effect has been attributed to its anti estrogenic effect which may be responsible for arrest of spermatogenesis in male and inhibitory effect on implantation of ovum in female. This constituent may prove to be a promising anti fertility agent devoid of side effect.

Anti diabetic effect: Ocimum shows prominent effect in lowering blood sugar level.

Other uses: Many people wear the ocimum, which is said to have certain physical medicinal properties. Its wood is considered as more powerful than any other gem that in protecting one from the negative influence. One can also buy several handicraft jewellery items made of tulsi wood.

7. 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 nematocidal and molluscicidal activity. Recently, it has shown antidiabetic and hepato protective property. It needs greater attention by the researchers to explore its full potential and efficient use in the human welfare. The present study clearly indicates that *Ocimum anumis* a rich source of phyto-constituents having lots of pharmaceutical application like treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases, arthritis, painful eye diseases, chronic fever, insect bite etc. The *Ocimum canum* L. has also been suggested to possess antifertility, anticancer, antidiabetic, antifungal, antimicrobial, hepatoprotective, cardioprotective, antiemetic, antispasmodic, analgesic, adaptogenic and diaphoretic actions.

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