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Review Article

DEVADARU (*CEDRUS DEODARA* (ROXB.) LOUD.): A CRITICAL REVIEW ON THE MEDICINAL PLANT

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ABSTRACT

Devadaru (*Cedrus deodara*) an important plant belongs to Pinaceae family found in the north-western Himalayas at altitude of 1200-3000 meter. The aromatic wood of this beautiful tree is used as carminative, anti inflammatory, diaphoretic, diuretics, antipyretic, antileprotic. In *Caraka samhita* it is one among the *Satanya shodhana* and *Anuvasanopaga* group of drugs and Sushruta also considered it as the *Vata Shamana* group, *Katuvarga* and *Eladi* group. It is the chief timber of north –west India and is used for all purpose of construction of railway sleepers, bridges, and even for furniture and shingles. The oil obtained is used for mange in horses and sore feet in cattle. It is in use since vedic period in temples and in making incense even said that by sitting under its shade many diseases cures especially asthma. Here the present review study is an attempt to provide reported detail information of this herb from various *Samhitas* and its study in modern area like its phytoconstituents and pharmacological activities.

KEY WORDS: *Devadaru, Cedrus deodara*, Phytochemistry, Pharmacological properties.

INTRODUCTION

The Himalayan Cedar is called *Devadaru / Devataru* (Tree of the Gods). The Deodar tree forest were the favorite living places of ancient Indian sages who were devoted to Hindu God Shiva. As in *Atharva veda* it is described by the name *Bhadra*. In *Kalpasutra* by the name Daru. It is also described in *Shaunik Atharveda Samhita*, *Paraskar grahsutra, Kaushik sutra, Patanjal mahabhapya*. In *Ramayan*, *Mahabharat* also there are hymns on it. In Britain, Ireland and France, people worshiped in the oak tree groves called druids (*Deru/vid*). In Europe it is noted since iron age (600 BC – 43 A.D.). Its historical use to construct the religious temples and in landscaping around the temple found tremendously.

Devadaru is one of the herbs mentioned by different groups *in Bruhatryis*, *Anuvasanopaga dashaimani*[1], *Stanya shodhana dashaimani*[2], *Katuskanda*[3], *Kashay skanda*[4], *Katuvarga (Acrid substances)*[5] *Eladi group*[6], *Vachadi group*[7], *Vatasamshamana varga*[8], *Eladi gana*[9], *Rodhradi gana*[10], *Vatagna gana*[11]

Scientific Classification[12,13]

Kingdom	:	Plantae
Phylum	:	Tracheophyta
Division	:	Pinophyta
Class	:	Pinopsida
Order	:	Pinales
Family	:	Pinaceae
Genus	:	Cedrus
Species	:	C. deodar

Vernacular Names[14,15]

Sanskrit	:	Bhadradaru, Surabhuruha, Amaradaru, Devakashtha, Daru, Suradaru, Amarataru
Assamese	:	Shajar Tuljeen
Bengali	:	Devdaroo
English	:	Deodar, Himalayan Cedar
Gujrati	:	Devdar, Teliyo Devdar
Hindi	:	Devdar, Devdaroo
Kannada	:	Deevdar
Kashmiri	:	Dadar, Dar, Deodar, Diar
Malayalam	:	Devataram
Marathi	:	Devdar, Telya Dedaroo
Punjabi	:	Diyar, Dewdar
Tamil	:	Tevadaram, Tevadari,

		Tevadaru
Telugu	:	Devdari Chettu, Devdaree
Urdu	:	Deodar

SYNONYMS[16-19]

Amaradidaru, Amlaradaru, Bhadradaru, Bhadrakashtha, Bhavadaru, Bhutahari, daru, Darubhadra, Daruka, devakashtha, Drikilima, Indradaru, indravruksha, kilima, Krumila, Mahadaru, Mastadaru, Putikashtha, Rudravat, Shakradraru, Shambhava, Shivadaru, Snehaviddha, Snehavruksha, Snigdhadaru, Sudaru, Surabhuruha, Suradaru, Suradruma, surahva.

In Ayurveda Samhitas also mentioned some synonyms like *Kilima*[20], *Macika*[21], *Suradaru*[22,23], *Pitadru*[24], *Surahva*[25], *Tridashahva*[26], *Badradaru*[27-29], *Pitadaru*[30], *Amaradaru*[31], *Suradruma*[32], *Badakashta*[33], *Amarakashta*[34], *Amaradaru*[35], *Amarahva*[36,37], *Daru*[38], *Sarala*[39]

BOTANICAL DESCRIPTION[40]

Devadaru is large evergreen tree upto 80m height and girth about 15m, with spreading branches and attractive dark green foliage. Leaves needles like 2.5-4cm long, 3 sided, clustered at the end of short branchlets. Wood strong, oily, aromatic, heart wood light yellowish-brown to brown in colour; Sap wood white.

Male and female cones on the same tree; male cones numerous 5-12cm, erect, solitary, cylindrical at the end of leaf. Bearing branchlets, females cones barrel shaped, borne singly at the tip of dwart shoots, seeds winged, 6 mm long, pale brown, wing 2.5 cm across, triangular and rounded. Flowering and fruiting Sept- Nov.

DISTRIBUTION[41]

Distributed in North west Himalayas from Kashmir to eastwards in Jammu and Kashmir, Himachal Pradesh, Uttaranchal and UP states between 1500-3000m; especially in Kishan Ganga, Kishtwar, Jhalum vally to Garhwal, Chemba, Jaunsal, Bashahr, Kulu, Tehri-Garhwal, Almora, Renikhat, Nainital, Chakvata, Mussorie, Simla and other areas. Distributed in Afghanistha and Pakistan.

PHYTOCHEMICAL PROPERTIES

The stem wood of Cedrus deodara consisted of (-)-wikstromal (75 - 79 %), (-)-matairesinol (9 - 13 %) and benzylbutyrolactol (7 - 11 %)[42], Himachalol[43], cedeodarin (6-methyltaxifolin), dihydromyricetin, cedrin (6-methyldihydromyricetin), cedrinoside[44], 3,4-bis(3,4-dimethoxyphenyl) furan-2,5-dione (BDFD) [45].

The pine needles of Cedrus deodara consisted of stigmasterol, oleanolic acid, parahydroxybenzaldehyde, syringaresinol, daucosterol, p-hydroxybenzoic acid, gallicin and gallic acid[46], 10-nonacosanol, dibutyl phthalate, protocatechuic acid, phthalic acid bis-(2-ethylhexyl) ester, (E)-1-O-p-coumaroyl-beta-D-glucopyranoside, 5-p-trans-coumaroylguinic acid[47], 9-hydroxy-dodecanoic acid, ethyl laurate, ethyl stearate, 3beta-hydroxy-oleanolic acid methyl ester, beta-sitosterol, shikimic acid, methylconiferin, ferulic acid beta-glucoside[48].

The essential oil from pine needles (Cedrus deodara) determined twenty-three components, representing 95.79% of the oil, were identified by gas chromatography mass spectrometry. The main components include α-terpineol (30.2%), linalool (24.47%), limonene (17.01%), anethole (14.57%), caryophyllene (3.14%), and eugenol (2.14%)[49].

The essential oil and extract obtained from the wood chips of *Cedrus deodara* by hydrodistillation Thirty four compounds were identified from the essential oil and twenty six from the extract accounting for 98.3 and 94.6% respectively of total identifications. While the major components of the oil were beta-himachalene (38.3%), alpha-himachalene (17.1%) and gamma-himachalene (12.6%), those of the extracts were E-gamma-atlantone (38.5%) and E-alpha-atlantone (10.2%)[50].

A new novel type of phenolic sesquiterpene, himasecolone, has been isolated in addition to isopimaric acid from the chloroform-soluble fraction extract.[51]

A new dihydroflavonol named deodarin has been isolated from the stem-bark of *Cedrus deodara.* From a detailed study of its reactions and spectra, it has been tentatively assigned the constitution 3′,4′,5,6-tetrahydroxy-8-methyl dihydroflavonol[52].

PHARMACOLOGICAL ACTIVITY

Water extract heartwood showed more antibacterial activity when compared to that of ethanol extract[53]. Wood oil attributed mast cell stabilizing activity, lipoxygenase activity and anti-inflammatory activity[54].

Aqueous extract of air dried stem bark of Cedrus deodara shows anti-inflammatory and

anti-arthritic activity against carrageenin-induced oedema, granuloma pouch, cotton pellet, tuberculin sensitivity reaction, formallin arthritis and adjuvant arthritis in albino rats[55].

The volatile oil extracted by steam distillation of *Cedrus deodara* wood was examined for its gastric antisecretory and antiulcer effect in the pylorus-ligated rat model and ethanol induced gastric lesions in rats[56], Immunomodulatory activity[57], antioxidant activity[58], cytotoxcity against human cancer cell lines[59].

The volatile oil of the wood of *Cedrus deodara* (50 and 100 mg/kg, p.o.) produced a significant inhibition of compound 48/80 and nystatin-induced rat paw edema. It also inhibited heat- as well as hypotonic solution-induced haemolysis of erythrocytes in vitro. The anti-inflammatory activity of the oil could be due to its membrane stabilizing action[60].

The volatile oil extracted by steam distillation of the wood of *Cedrus deodara* was examined for its oral anti-inflammatory and analgesic activity at the doses of 50 and 100 mg/kg body weight. It produced significant inhibition of carrageenan-induced rat paw edema and of both exudative–proliferative and chronic phases of inflammation in adjuvant arthritic rats at doses of 50 and 100 mg/kg body weight. The oil at both tested doses was found to possess analgesic activity against acetic acid-induced writhing and hot plate reaction in mice[61].

Himachalol has been identified as the major antispasmodic constituent in the wood of *Cedrus deodara.* The pharmacological studies of himachalol on various isolated smooth muscles (guinea pig ileum, rabbit jejunum, rat uterus, and guinea pig seminal vesicle) and against different agonists (acetylcholine, histamine, serotonin, nicotine, and barium chloride) indicated spasmolytic activity similar to that of papaverine[62].

The ethanolic extracts stem wood significant fall in blood glucose profile in a single dose experiment on Streptozotocin-induced diabetic rats[63]. The anticancer potential of AP9-cd, a novel lignan composition from Cedrus deodara in human leukemia HL-60 cells[64]. 3,4-bis(3,4-dimethoxyphenyl)furan-2,5-dione (BDFD) isolated from the heartwood ethanolic extract of *C. deodara* was evaluated for its anticonvulsant activity[65].

The effect of Cedrus deodara root oil on the histopathology of different gastrointestinal organs of Wistar rats. This oil was used traditionally as an anti-ulcer agent.[66] The essential oil from pine needles was determined, and its antioxidant and antimicrobial activities were evaluated[67].

The extracts of Cedrus deodara decreased serum glucose, total cholesterol and triglyceride, low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels and increased high density lipoprotein (HDL) significantly has compared to MSG-control rats[68].

Antibacterial activity of water-soluble extract from pine needles of Cedrus deodara (WEC) was evaluated on five food-borne bacteria, and its related mechanism was investigated by transmission electron microscope. In vitro antibacterial assay showed that WEC possesses a remarkable antibacterial activity against tested food-borne bacteria including Escherichia coli, Proteus vulgaris, Staphylococcus aureus, Bacillus subtilis and Bacillus cereus, with the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) values in the ranges of 0.78-12.5 mg/ml and 1.56-25mg/ml, respectively[69].

PROPERTIES AND ACTION[70]

Rasa	*:*	*Tikta*
Guna	*:*	*Laghu, Snigdha*
Virya	*:*	*Ushna*
Vipaka	*:*	*Katu*
Karma	*:*	*Vatahara, Kaphahara, DuSHtavrana Shodhaka*

THERAPEUTIC USES: *Vibandha, Adhmana, Shotha, Tandra, Hikka, Jvara, Prameha, Pinasa, Kasa, Kandu, Krumi, Kushtha, Amavata, Raktavikara, Sutikaroga.*

Useful Parts: Leaves, Heartwood, Bark, Oil, Resin.

Dosage: Bark powder 1-5gr; Decoction: 50-100ml; Oil: 20-40 drops.

IMPORTANT PREPARATIONS AND INDICATIONS

S.No	Important preparations	Indications
1.	*Agurvadya taila*[71]	*Shita jvara*
2.	*Kalyanaka grutha*[72-73]	*Apasmara, Jvara, Kasa, Kshaya, Vatarakta Pratishyaya, Pandu, Jirna jvara, Shvasa, Gulma, Unmada*, cumulative poisoning.
3.	*Pippalyadya taila*[75]	*Anuvasana* type of medicated enema for *Arshas* and *Mudha* vata, prolapsed rectum, *Shula*, *Mutrakruccha, Pravahika* etc.
4.	*Hriveradi ghruta*[76]	*Arshas, Atisara, Grahani, Pandu, Jvara Aruci, Mutrakruccha, Gudabramsha* etc.
5.	*Dashamuladya ghruta*[77]	Promotes power of digestion, strength and complexion, alleviates *Vayu*, and helps digestion
6.	*Kiratadya churna*[78]	*Grahani* (spru syndrome), *Gulma, Shula, Aruci, Jvara, Kamala, mukharoga.*
7.	*Katukadya ghruta*[79]	*Rakta pitta, Jvara, Daha, Shvyathu, Bhagandaram, Arshas* etc.
8.	*Punarnavadi mandura*[80]	*Pandu, Pliha, Arshas, Vishama jvara, Shotha, grahani* etc.
9.	*Mandura vataka 1*[81]	*Pandu, Arshas, Kushta, Ajirna, Sotha, Urusthamba* etc.
10.	*Mandura vataka 2*[82]	*Pandu, Grahani, Arsha*
11.	*Vyoshadya ghruta*[83]	*Mrudbhakshana Pandu*
12.	*Tryushanadya ghruta*[84]	*Kasa, Jvara, Gulma, Aruci, Pliha, Shirashula, Parshvashula, Kamala etc.*
13.	*Khadiradyalepana*[85]	*Kaphaja visarpa*
14.	*Devadarvadi taila*[86]	*Karna shula*
15.	*Maha nila taila*[87]	Internal and external administrations in various diseases, Nasya, apply overhead, promote eyesight and longevity and cure the diseases of the head. Cure of grey hair
16.	*Shrivestakadi yoga*[88]	*Urusthambha*
17.	*Saindhavadi taila*[89]	Oil soaked in tampon kept inside the vagina cures pain in *Vatika yoniroga*
18.	*Guducyadi taila*[90]	Oil soaked in tampon kept inside the vagina cures gynecic diseases caused by *Vatika*
19.	*Amrutadya taila*[91]	*Unmada, Apasmara, Vatavyadi*
20.	*Panchagavya ghruta*[92]	*Vishama jvara*
21.	*Pathadi ghruta*[93]	*Shavsa, Agnisada, Svarabheda*, 5 types of *Kasa* including in advanced stage
22.	*Devadarvadi Kashayam*[94]	*Udavarta*
23.	*Devadarvadi churna*[95,96]	*Udavarta,* Vataja roga
24.	*Siddharthaka ghruta*[97]	*Krumi, Kushta*, slow poisoning, *Shvasa, Kaphaja* disorders, *Vishama jvara,* All types of seizures by *Graha, Unmada, Apasmara*
25.	*Kalyana ghruta*[98]	*Gulma, Kasa, Jvara, Shvasa, Kshaya, Unmada.*
26.	*Gandha taila*[99]	Fractures and dislocations

27.	*Nila ghruta*[100]	External application in incurable skin diseases
28.	*Lashunadi ghruta*[101]	*Vataja gulma*
29.	*Ksharagada*[102]	*Gulma, Udavarta, Arshas, Grahani Krimi, Apasmara, Unmada* etc.
30.	*Mandura vataka*[103]	*Pandu, Kushta, Shopha, Uristambha, Arocaka, Arshas*, Kamala
31.	*Anutaila*[104]	Skin, shoulders, neck, face and chest become thick well developed, sense organs become strong, disappear of grey hair
32.	*Devadarvarishta*[105, 106]	Asadya Prameha, Grahani, Arshas, Dadru, Kushta
33.	*Rasnadi kvatha*[107]	*Vataja jvara*
34.	*Sudarshan churna*[108]	8 types of *Jvara, Pliha, Gulma*
35.	*Pippalyadi taila*[109]	*Arshas, Mudavata, Guda Nissarana, Shula, Mutrakruccha*
36.	*Maha Vishagarbha taila*[110]	All *Vata* diseases, *Grudrasi, Mahavata, Dandapatanaka*
37.	*Narayana taila*[111]	*Vata diseases*
38.	*Dashamuladi kvatha*[112]	*Udara, Shotha, Slipada, Galaganda, Vata roga*
39.	*Pradarantaka loha*[113]	*All types of Pradara, shula, Pandu*
40.	*Devadarvadi kvatha*[114]	Sushka kasa, Jvara, Mutrakruccha
41.	*Mahabala taila*[115]	*Vata diasese*
42.	*Khadirarishta*[116]	*Kushta, Hrudroga, Pandu, Gulma, Krimi etc.*
43.	*Prasarini taila*[117]	All types of *Vata* and *Kapha disease, Kubja, Pangu, Khanjatva, Grudrasi etc.*
44.	*Doshaghna Lepa*[118]	External application in all types of *Shotha*
45.	*Candraprabha Vati*[119]	20 types of *Prameha, Mutrakruccha, Ashamri* etc.
46.	*Kshara taila*[120]	Discharge pus in ear, *Karna nada, Karna shula, Krimi*, and other disease of ear and mouth.
47.	*Prabhanjana Vimardana Taila*[121]	80 types of *Vata roga*
48.	*Devadaru baladi taila*[122]	*Sarvanga vata*
49.	*Chincadi taila*[123]	80 types of *Vata roga*
50.	*Rasnairandadi Kvatha Churna*[124]	*Sarvanga vata, Ekangavata* etc.
51.	*Indukanta ghruta*[125]	*Vataroga, Kshaya, Mahodara, Gulma, Shula, Nimnonnata jvara*
52.	*Karpasasthyadi taila*[126]	*Sarva vataroga, Apabahuka, Pakshaghata, Ardita*
53.	*Kottamcukkadi taila*[127]	*Vataroga*

In *Charaka Samhita, Devadaru* used in the treatment of various diseases

1. Fumigation in *Arshas* with Tumburu, Vidanga, *Devadaru* and Akshata (barly) mixed with ghee. [128]
2. Decoction of *Devadaru* advised the patients suffering with *Hikka, Svasa.*[129]
3. Decoction of *Devadaru, Vaca, Vidanga, Bhutika, Dhanyaka* useful in *Kaphaja atisara*[130]
4. Paste made with *Devadaru, Haridra, Dariharidra, Vaca and Katukarohini* take with honey in *Urusthambha*[131]

In *Sushruta Samhita, Devadaru* used in the treatment of various diseases

1. Fumigation on wound with *Devadaru, Srivesthtaka, Sarjarasa, Sarala* can useful in wound healing. [132]
2. *Ropana taila* (healing oil) prepared with *Devadaru, Kalanusarya (Tagara/Shailaja), Aguru, Haridra, Druharidra, priyangu, Rodhra* helpful in healing wounds. [133]
3. The oil of prepared with *Devdaru, Sarala, Shimshipa, Aguru* and *Gandira*, can cleanse septic wounds.[134]
4. The collyrium consisting *Saindhava, Deadaru, Shunti* pasted with *Matulunga* juice, helpful in *Sushkakshipaka* eye disease. [135]
5. *Devadaru, Balaka, Shumthi, Kushta* used as a *Lepa* in *Kaphaja Abhishyanda* and *Kapha Adhimantha.* [136]
6. Paste made with *Devadaru, Shunti, Musta, Saindava* and buds of *Cameli* added with *Sura* and used it as a collyrium in *Kaphaja Abhishyanda* can cure Itching and inflammation in eye. [137]
7. *Dipika taila* prepared with *Devadaru, Kushta, Sarala* useful to cure ear pain. [138]
8. *Tikshna dhuma* with *Devadaru* and *Citraka* useful in *Nasasrava* disease.[139]
9. Smoking therapy containing the *Sarala, Kinihi, Devadaru, Danti* and *Ingudi* useful in *Kaphaja Pratishyaya.* [140]
10. The oil processed with *Devadaru, Amrutvalli, Nimba, Himsra, Abhaya, Vrukshaka, Pippali, Bala* useful in the management of *Galaganda.* [141]
11. Decoction made of *Devadari, Shatapushpi, Vaca, Kushta, Harenuka, Kustumburu, Nalada* and *Musta*. Decoction together with honey and sugar useful in *Vatika* fever. [142]
12. Decoction made of *Devadari, Nagara, Dhanyaka, Bharngi, Abhaya, Vaca, Parpataka, Mustaka, Bhutika and Katphala mixed with honey and Hingu useful in* Kaphavata fever. [143]
13. The decoction made with roots of *Devadaru, Nala, Vetasa, Murva* useful in all types of fever. [144]
14. The decoction of *Devadaru*, *Siddhartaka*, *Shatahva*, *Katurohini* useful in *Amaja* type of Atisara. [145]
15. The *Ghruta* prepared with *Devadaru, Sauvarcala, Sarjika* etc., herbs cure *Vataja Gulma* and also act as appetizer. [146]
16. The smoking sticks prepared with *Devadaru, Haridra, Candana* etc., herbs helps in *Shvasa* with obstruction with mucus. [147]
17. One *Aksha* of paste of *Devadaru, Musta, Abhaya, Murva* and *Madhuka* administered as a drink for obtaining relief from the urinary disorder. [148]

In *Asthanga Hrudaya, Devadaru* used in the treatment of various diseases

1. *Sannipatajvara: Vyaghri, Devadaru, Nisha, Ghana, Patolapatra, Nimbhatvak, Triphala, Katuki* decoction useful. [149]
2. *Lehya* (confections) prepared with *Devadaru, Shathi, Rasna, Karkatakhya* and *Duralabha* mixed honey and *Tila taila* cure cough caused by *Kapha* and *Vata*. [150]
3. Leaves of *Haridra*, root of *Eranda, Laksha, Manashila, Devadaru, Ela* and *Mamshi* prepared as a cigarette *Dhumapana* can cure *Svasa* and *Hikka.* [151]
4. Decoction of *Devadaru* should be consumed by the patients of dyspnoea and hiccup when they are thirsty. [152]
5. Oil made *Bilva, Rasna, Yava, kola, Devadaru, Punarnava, Kulatha* and *Panchamula* useful in *Vataja hrudroga* as *Nasya*, *Pana*, Enema. [153]
6. Powder of *Devadaru, Ghana, Murva, Yashtimadu* and Haritaki consumed either with *Sura*, milk or water in all varieties of *Mutraghata*. [154]
7. Powder of buds of *Jati*, *Saindhava*, *Devadaru* and *Mahaushadha*, made into wick with *Prasanna* (scum of *Sura*) and used as a eyelash cures swelling and itching. [155]
8. *Devadaru* made as a paste with goat's urine and mixed with by application destroys *Pilla* types of eye diseases. [156]

CONCLUSION

Devadaru tree grow vigorously in the high altitude of the western Himalayas. It means 'wood of the gods'. Now a day's many experimental studies conducting on Leaves, Heartwood, Bark, Oil, Resin of *Devadaru* to find out the usefulness in the various diseases and positive results are getting by the usage of *Devadar.*

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