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An Overview on the Ornamental Coniferous Tree *Cedrus deodara* (Roxburgh) G. Don (Himalayan Cedar)

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ABSTRACT

Cedrus Deodara (Roxburgh) G. Don is an essential aromatic coniferous tree that belongs to the family *Pinaceae.* It is commonly called as Himalayan Cedar in English and Devdaar in Hindi and *Devdaru* in Sanskrit. The leaves of the plant (pine needles) give it an ornamental appearance. It is abundantly found in the Western Himalayan range. The plant has its description in almost each Ayurvedic compendium including *Charak Samhita*, *Sushrut Samhita* and *Ashthang Hrudya* and used against diseases like, respiratory problems, dysentery, diarrhoea, inflammation, eyes and nasal problems, goitre and graves diseases, fever, diarrhoea and urinary disorders etc. In addition, the plant is well used in folkloric practices of disease treatment. The secondary metabolite system of the plant is comprised of alkaloids, flavonoids, phenols, glycosides, resins and tannins still the characteristic feature of the plant is its high essential oil content which is comprised of many important phytoconstituents such as deodarone, alpha pinene, cisocimene, limonene and alpha longipinene etc. Each phytoconstituent is associated with many therapeutic and pharmacological activities such as anti-bacterial, anti-cancer, anti-inflammatory and anti-oxidant etc. Apart from the medicinal value of plant, it provides excellent quality timber and building manufacturing material. The present review is the overall summary of the traditional utilization, phytochemistry and therapeutic significance of *Cedrus Deodara.*

Key words: *Devdaar, Rasapanchak, Alpha pinene, Deodarone, anti-bacterial*

INTRODUCTION

Plants have a significant impact on humankind in all aspects i.e., environmentally, economically, industrially, spiritually, historically and aesthetically.[1] These are extensively used throughout the world for health maintenance and are considered the potent source of many important modern drugs because their phytoconstituents serve as the chemical entities in drug manufacturing.[2,3] Plant-based products have various trade names such as herbal drugs, botanical drugs, botanicals, phytomedicines, traditional medicines, herbal medicines, traditional herbal medicinal products, natural health products, or plant food supplements.[4] There are almost 15,000 different plant species are used in therapeutic practices in India due to their significant secondary metabolite system comprised of saponins, tannins, alkaloids, phenols, flavonoids, fixed oils and triterpinoids etc.[5] One such extensively used medicinal plant is *Cedrus deodara* (Roxburgh) G. Don (figure 1), commonly known as Himalayan Cedar in English and Devdaar in Hindi. The Sanskrit name Devdaru depicts the meaning "the forest of the Gods" therefore; it is also entitled as "a divine tree". Due to its abundance in the Kashmir valley, it is also called as "the pearl of Kashmir" in India. It is an important cedar species of the family *Pinaceae*, the largest conifers family comprised of more than 230 species with high economic value.[6-10] As per many authors,

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ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

there are four evergreen species of coniferous trees included in the genus cedrus with different geographical distribution which are *Cedrus brevifolia* in Cyprus, *Cedrus atlantica* in Algeria and Morocco, *Cedrus libani* in Lebanon, Syria and Turkey and lastly *Cedrus deodar* in India and Afganistan.[11] *Cedrus deodara* is a renowned evergreen beautiful sacred and ornamental coniferous tree found extensively in the Himalayas. Its leaves commonly called as pine needles, give it an aesthetic appearance.[12-14] It is an important aromatic plant due to rich amount of essential oils in its parts. The nature of each part of the plant is bitter, hot, slightly pungent and oleaginous. The plant has a very rich history of utilization in many ethnobotanical practices of different cultures around the world such as in India, Pakistan, China and Korea etc. it is used against a variety of diseases such as inflammations, dyspepsia, insomnia, cough, fever, urinary discharges, ozoena, bronchitis, itching, elephantiasis, tuberculous glands, leucoderma, opthalmia and piles. The heartwood of *Cedrus deodara* is traditionally used to improve cerebral function, balancing the mind, body connection, central nervous system and to provide strength to the brain. Wood is also used as carminative and expectorant.[14-21] *Deva Chooranam* is an important *Siddha* herbal formulation made up of *Cedrus Deodara*, *Alpinia Galanga* and *Cinnamomum Tamala* which are used against Chronic fever, diarrhea, dysentery, oral ulcers, respiratory. ailments, skin diseases and tumours.[22,23] The pine needles of the plant are extensively used in the food and pharmaceutical industries.[24] The secondary metabolite system of the plant is comprised of alkaloids, glycosides, tannins, fixed oils, flavonoids and triterpinoids etc. The major phytoconstituents of the plant are wikstromal, matairesinol, dibenzylbutyrolactol, bergapten, isopimpinellin, lignans 1,4 diaryl butane, benzofuranoid neo lignan, isohemacholone, deodarone, atlantone, deodarin, deodardione, limonenecarboxylic acid, -himacholone, -himacholone, cedrin (6-methyldihydromyricetin), taxifolin, cedeodarin (6- methyltaxifolin), dihydromyricetin and cedrinoside.[25] These phytoconstituents are associated with many important therapeutic activities like anti-spasmodic, anti-bacterial, anti-urolithiatic, anti-obesity, anti-allergic, immunomodulatory, anti-cancer, anti-arthritis.[26-35] Apart from its therapeutic aspects, the plant is a valuable source of commercial timber in the Western Himalaya region. Its wood is of excellent quality with durable and decay-resistant properties. The plant is extensively used in the manufacturing of building material and as a source of fuel.[36-40] Vernacular names and taxonomical classification are given in table no. 1 and 2.

Table 1: Vernacular Names of *Cedrus Deodara*[41]

English	Himalaya cedar
Hindi	*Devdaar, Diar, Diyar*
Sanskrit	*Devdaru, Amara, Devahvaya*
Urdu	*Burada Deodar*
Gujarati	*Devdaar*
Marathi	*Deodar*
Malayalam	*Devadaru, Devadaram, Devataram*
Kannada	*Bhadradaaru, Daevadaaru, Gunduguragi*
Marathi	*Devadaru, Ewadar*
Tamil	*Devadaram, Tevataram, Tunu Maram*
Latin	*Cedrus Deodara*
Tibetan	*Than Sin*
Nepali	*Devadaru*

Table 2: Taxonomical Classification of *Cedrus deodara*[42]

Taxonomical Rank	Taxon
Kingdom	Plantae
Division	Pinophyta
Class	Pinopsida
Order	Pinales

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

Family	Pinaceae
Genus	*Cedrus*
Species	*deodara*

Morphological Description[43-45]

Cedrus deodara is an evergreen tree reaches up to the height of 60 meters. It has horizontal branches and branchlets with slender and nodding tips. The leaves are acicular glaucous green that are about 2.5-5 cm long with the needle like structure. The bark is grey or reddish brown in color having vertical and diagonal assures. The wood is hard and aromatic with light yellowish- brown to brown color, marked annual rings and white lines of medullary rays. It is a bisexual plant with male and female cones on separate branches. Female cones are cylindrical and are about 2.5 to 4.5 cm in size with barrel structures that are born solitary on the tips of dwarf shoots. The fruits are brown, oval and 3-6 inches long with dry or hard covering.

Geographical Distribution[46-49]

Cedrus deodara is widely distributed in the Western Himalayas and found profusely in countries like China, Afghanistan, Pakistan, North-West India (Himachal Pradesh, Uttarakhand and Kashmir) and Nepal at an altitude of 2,000-3,200 m. Deodar forests are abundantly found from Kashmir to Garhwal.

Phytochemistry

Cedrus deodara is the potent source of polyphenolic compounds.[50] It is also comprised of many other important phytochemicals. For instance, the ethanol extract of cedar wood contains alkaloids, glycosides, tannins, fixed oils, flavonoids and triterpinoids.[51] Selvi et al., also reported the presence of alkaloids, flavonoids, phenols, glycosides, resins and tannins in water and ethanol extract of the plant.[52] The mineral content of the plant is comprised of organic carbon, nitrogen, phosphorus, potassium, calcium and magnesium.[53] The very first isolated chemical from the *Cedrus deodara* wood oil was deodarone.[54] Taxifolin and cedeodarin are the known flavanonols present in the plant.[55] Many studies have been carried out on the plant to evaluate its phytoconstituents. For instance, Zhang et al., isolated a novel compound namely 1-[3-(4-hydroxyphenyl)-2-propenoate] -D-glucopyranoside along with nine other phytochemicals beta-sitosterol, shikimic acid, 10-nonacosanol, dibutylphthalate, protocatechuic acid, phthalic acid bis-(2-ethylhexyl) ester, 5-p-trans-coumaroylquinic acid, ferulic acid beta-d-glucoside and (+)- (6s,9r)-9-o-beta-d-glucopyranosyloxy-6-hydroxy-3-oxo-alpha-ionol from the pine needles of the plant.[56] Ohmoto et al., isolated seven phytoconstituents from the pollen grains of the plant which were diterpenoids, dehydroabietic acid, 7 beta, 15-dihydroxydehydroabietic acid, 7 alpha, 18 dihyrdroxydehydroabietanol acid, hexadecane-1,16-diol 7-caffeoyl ester, naringenin and beta-sitosteryl beta-D-glucoside.[57] Wu et al., extracted a novel phytochemical 3-p-trans-coumaroyl-2-hydroxyquinic acid from 50% methanol extract of pine needle of *C. deodara* along with seven other known phenolic compounds by mass spectrometery and nuclear magnetic resonance and suggested the compound is associated with anti-oxidant activity.[58,59] Aggarwal et al., reported the presence of two novel lignans from the lead acetate-purified butanol-soluble fraction of cedrus wood namely meso-secoisolariciresinol and cedrusinin.[60] Liu et al., examined the reported the presence of two novel myricetin glycosides (myricetin-3-*O*-(6″-*O*-*E*-*p*-coumaroyl)-*α*-*D*-glucocopyranoside and 3′,5′-di-*O*-methylmyricetin-3-*O*-(6″-*O*-acetyl)-*α*-D glucopyranoside) along with three known flavonoids (myricetin, cedrin, and 2*R*,3*R*-dihydromyricetin) in pine needles of *Cedrus deodara*.[61] Chaudhary et al., identified two novel sesquiterpenes, (E)-(2S,3S,6R)-atlantone-2,3-diol and (E)-(2S,3S,6S)-atlantone-2,3,6-triol along with two known antifungal sesquiterpenes namely atlantolone and (E)-α-atlantone.[62] The composition of essential oil of various parts of the plant has been extensively explored by many researchers. For instance, Kumar et al., evaluated the bark essential oil of the plant and reported the presence of monoterpenes (alpha pinene, cisocimene, limonene, bicyclo[2.2.1] heptane-2,5-diol, 1,7,7-trimethyl, (2-endo,5-exo), alpha terpineol), sesquiterpenes (alpha longipinene, alpha-copaene,

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

alpha ylangene, longifolene, caryophyllene, alpha–humulene, alpha–muurolene, e-cadinene, 1h-naphtho[2,1-b]pyran, 3-ethenyldodecahydro-3,4a,7,7,10a - pentamethyl-, [3r(3a,4aa,6aa,10aa, 10ba)]-, iso-velleral, epijuvabione, propanoic acid, 2-methyl-, (dodecahydro-6a-hydroxy-9a-methyl-3-methylene-2,9-dioxoazuleno[4,5-b]furan-6-yl) methyl ester, [3as-(3aa,6a,6aa,9aa,9ba)]-, verticellol, alpha gurjunene and alpha ionone) and diterpenes (cambrene, cembrenea, kaurene, isopimaral, dehydroabietal, 4-epi-abietal, iso pimaradien-3-ol, glycocholic acid and propanoic acid, 2-(3-acetoxy-4,4,14-trimethylandrost-8-en-17-yl).[63] Saab et al., analyzed the essential oil of leaves and identified many constituents by using gas chromatography–mass spectrometry (GC-MS). The major constituents identified were benzaldehyde, α-pinene, β-pinene, myrcene, limonene-α, β-caryophyllene, β-copaene, α-himachalene, β-humulene, γ-muurolene, β-himachalene, germacrene d, α-muurolene, δ-cadinene and γ-amorphene.[64] Chung et al., investigated the essential oil of pine needles and petroleum ether extract for their chemical composition. The major components of essential oil were α-pinene, α-myrcene, dl-limonene, *trans*-caryophyllene, α-humulene, linalyl propionate, δ-cadinene, caryophyllene oxide, 1-dodecanol, α-cadinol, t-muurolol and dodecanoic acid whereas butyl acetate, 4-allyloxy-2-methyl penta-en-2-ol, 2,2-dimethyl pentanal, α-pinene, 2-methyl-5-phenyl-5-pentanonenitrile, benzoic acid, ethyl ester of dodecanoic acid, butyl ester of 5-oxohexanethioic acid and caryophyllene oxide were the major components reported from the petroleum ether extract.[65] As per Gao et al., limonene, 2, (10)-pinene, α-pinene, and myrcene are the major volatile organic compounds of *Cedrus deodara.*[66] Lee et al., reported the presence of borneol, bornyl acetate, limonene, camphene, and α-pinene as the major constituents of essential oil of the plant.[67] Chuadhary et al., analyzed the composition of *Cedrus deodara* essential oil and extract of woodchips by gas chromatography flame-ionization detection (GC-FID) and (GC-MS) methods. The major compounds analysed were longifolene, aromadendrene, allo-aromadendrene, α–himachalene, α–humulene, z-β-farnesene, γ-himachalene, cubinene, β-himachalene, δ-cadinene, 8-cedren-13-ol-acetate, γ-cadinene, (E),(E)-farnesol, albicanol, 4,5-dehydroisolongifolene, β-vativenene, cis-α-bisabolene, ar-curcumene, α-dehydro-ar-himachalene, 9,10-dehydroisolongifolene, γ-dehydro-ar-himachalene, trans-α-bergamotene, vestitenone, cis-α-bergamotene, oxidohimachalene, β-himachaleneoxide, caryophyllene oxide, β-bisabolol, longiborneol, β-atlantone, (Z)-γ-atlantone, himachalol, (E)-γ-atlantone, deodarone, deodarone isomer, (Z)-α-atlantone, aristolone, (E)-α-atlantone and 14-oxy-α-muurolene.[68]

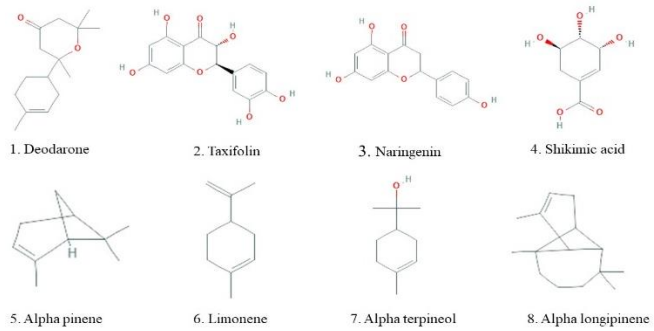

Figure 2: Chemical Structures of some of the Phytochemicals of *Cedrus deodara*

Traditional and Modern View

Ayurvedic View

Ayurveda works mainly on *Tridosha* theory i.e., three biological forces of the body i.e., *Vata* (space and air), *Pitta* (fire) and *Kapha* (water and earth).[69] In Ayurveda materia medica, *Cedrus deodara* is an esteemed plant used to treat a variety of diseases. It has many synonyms such as *Kilima*, *Macika, Suradaru, Pitadru, Surahva, Tridashahva, Badradaru, Pitadaru, Amaradaru, Suradruma, Badakashta, Amarakashta, Amaradaru, Amarahva, Daru* and *Sarala*. The *Karma* of the plant is *Kapha-Vata Hara*, *Dipana*, *Kasahara*, *Dushta Vrana Shodhaka*. It has been described in many Ayurvedic compendiums such as in *Charaka Samhita,* the decoction of the plant along with many other plants is used in the treatment of hiccups (*Hikka*), respiratory problems (*Svasa*), dysentery and diarrhoea *(Kaphaja Atisara)* whereas the paste of the plant along with many other plants It is used in the

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

treatment of hemiplegia (*Urusthambha*). In *Sushruta Samhita,* it is used in wound healing, inflammation, eyes and nasal problems, goitre and graves diseases, fever, diarrhoea and urinary disorders. In *Asthanga Hrudaya,* it is used to treat fever, cough, hiccups, urethritis and eye disorders.[70,71] Rasapanchak of *Cedrus Deodara* is given in table no. 3.

Table 3. Rasapanchak of *Cedrus deodara*[72]

Sanskrit/English	Sanskrit/English
Virya/Potency	*Ushna*/Hot
Vipak/Metabolic Property	*Katu*/Pungent
Guna/Physical Property	*Laghu*/Light, Snigdha/Slimy
Rasa/Taste	*Tikata*/Bitter

Actions and Properties of *Cedrus deodara*[73]

Sansthanik karam wahay: It has anti-inflammatory, analgesic, anthelminthic and wound healing properties used locally in skin diseases.

Abhyantar nadi sansthan: It has analgesic properties and is mainly used to treat osteo-arthritis, rheumatoid arthritis, sciatica, headache and other pain disorders.

Paachan sansthan: It acts as an appetizer and enhances the digestive system and ismainly used against flatulence and constipation.

Rakatwah sansthan: It acts as a cardiac tonic, blood purifier and anti-inflammatory agent and is used against conditions like elephantiasis, syphilis, goitre and graves' disease.

Swasan sansthan: It has mucolytic, antitussive properties and mainly used to treat hiccups, chronic cough and sinusitis.

Mootrawah sansthan: It has anti-diabetic properties, induces urine formation and helpful in the treatment of dysuria and other urine disorders.

Prajanan sansthan: It cures diseases of puerperium, uterine and improves lactation.

Twacha: It induces sweat and cures skin diseases.

Taapkaram: It has anti-pyretic activity.

Saatmikaran: It has anti-obesity and anti-hyperlipidaemia actions.

Ayurvedic Formulations

Khadirarishta: It is a polyherbal formulation which is used in Ayurvedic practices to treat chronic skin diseases.[74]

Mustadi Kwatha: This polyherbal formulation is used in the management of *Prameha* (diabetes mellitus), *Mutrakrichha* (urinary system related disease) and *Santarpanjanya Vyadhi* (disease due to over nutrition).[75]

Folk View

The rural population has good knowledge about the plants and they use medicinal plants more commonly than allopathic medicines because of the easy availability of medicinal plants and their better health impacts without causing any severe side effects.[76] For instance, the rural population of many areas worldwide such as Nepal, India, Pakistan and Sri Lanka etc. uses *Cedrus deodara* in many folkloric practices to treat a vast array of human ailments. The locals of Karnali zone, western Nepal, use essential oil of the leaves to get relief from rheumatic pain.[77] In Baitadi and Darchula districts, West Nepal, people use essential oil of cedar wood topically to treat skin disorder scabies.[78] The bark and stem oil is used externally to treat rashes and ulcers, headache, rheumatic pain and as a lice and tick's repellent in Kishatwar, Jammu Kashmir whereas in Sewa River catchment area, people use bark oil as a diuretic, carminative, antiflatulent, and to treat urinary disorders.[79,80] In Kumaun, Uttarakhand, the bark and wood fumes are used as snake repellent whereas the locals of Nanda Devi National Park, use bark decoction against fever and dysentery.[81,82] In Sri Lanka, the plant is used as a skin care regime.[83] The wood oil is used against many skin diseases in some areas of Pakistan.[84]

Modern View

The primary goal of traditional medication systems is to achieve a holistic approach to health rather than just suppressing the symptoms of diseases as

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

allopathic medications.[85] Therefore, the market value of traditional herbal drugs/products of Ayurveda, Siddha and Unani (ASU) is increasing day by day but so are the chances of quality degradation.[86,87] Pure herbal drugs are associated with negligible adverse health impacts and which is the reason behind their preference over synthetic drugs.[88] But in the present scenario several factors are promoting the quality degradation of herbal products such as unavailability of required species (due to endangerment, extinction, deforestation and high cost), morphological similarity, similar local and scientific names, mishandling, deterioration (quality impairment of a drug,) admixture (addition of one substance to another either unintentionally or by ignorance or carelessness), sophistication (intentional adulteration), substitution (addition of different species or substance in place of original drug), inferiority (any sub-standard drug), spoilage (microbial attack).[89,90] These alterations make the herbal drug impure and toxic which may lead to severe health conditions. Therefore, modern herbal products must pass the authentication check to ensure their safety and efficacy, ultimately promoting the domestic and International markets of herbal products.[91]

Reported Therapeutic and Pharmacological Activities of *Cedrus deodara*

The therapeutic and pharmacological activities of *Cedrus deodara* have been extensively explored by many researchers. The reported data on its various therapeutic and pharmacological properties are given below:

Anti-microbial

Ramzan et al., synthesized Cu@TiO_2 nanoparticles from the extracts of *Cedrus deodara* by using green synthesis method and revealed the remarkable inhibitory actions of 8% of these nanoparticles against *E. Coli* and *S. Aureus* with the inhibition zone up to 29 mm suggested the anti-bacterial activity of nanoparticles.[92] Wu et al., carried out a study to check the anti-bacterial activity of the compound isolated from pine needles namely 3-*p*-*trans*-coumaroyl-2-hydroxyquinic acid (CHQA) against *Staphylococcus aureus*. The parameters of observation were ATP concentration, respiratory activity, succinate dehydrogenase (SDH) activity, DNA synthesis, and interaction between CHQA and *S. aureus* DNA. The major findings of the study were remarkable reduction in the intracellular ATP concentration with a slight increase in respiratory activity and SDH activity. The DNA synthesis was restrained and interaction of the compound with *S. aureus* DNA by groove binding mode was observed which resulted in dysfunctioning of the cells and death.[93] Wu et al., suggested the effective anti-bacterial activity of the compound isolated from the pine needles namely *2R*,*3R*-dihydromyricetin (DMY) against *Staphylococcus aureus*. The findings of the study revealed that the membrane integrity of the tested micro-organism was disrupted by DMY treatment. A marked decrease in membrane fluidity and changes in membrane protein conformation effectively indicated the anti-microbial activity of the compound.[94]

Anti-inflammatory

Chandur et al., evaluated the anti-inflammatory potential of petroleum ether, chloroform and alcoholic extracts of *Cedrus deodara* heart wood in a study carried on CFA (complete freund's adjuvant) induced paw edema in rat models. It was observed that the local application of all the extracts caused a remarkable inhibition of paw edema. The study suggested the use of plant in inflammatory conditions such as arthritis.[95] Manne et al., suggested that the methanolic extract of the stem bark is effective against carrageenan induced rat paw oedema at the dosage of 100mg/Kg body weight.[96] Shinde et al., evaluated the anti-inflammatory effect of volatile oil of wood against carrageenan-induced rat paw edema. The results indicated that the oral administration of the volatile oil at the dosage of 50 and 100 mg/kg body weight had a remarkable inhibitory impact on paw edema.[97]

Anti-oxidant

Xu et al., investigated the anti-oxidant potential of ethanol extract of *Cedrus deodara* pine needles in an

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

in-vitro study. It was revealed that the radical scavenging activity of the extract was remarkable in ABTS (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) and DPPH (2,2-diphenyl-1-picrylhydrazyl) assays. The extract also scavenged the reactive oxygen from hydroxyl and hydrogen peroxide as well as it reduced the ferric ion and lipid peroxidation which suggested the effective anti-oxidant activity.[98] Jain et al., suggested that the aqueous extract of the plant at the dosage of 500mg/kg, has a very effective role in lowering down the oxidative stress induced by alloxan in the diabetic rat models. The effect of the extract was observed in lipid peroxidation level in liver which was reduced to a significant extent.[99]

Anti-cancer

Shi et al., investigated the anti-cancer activity of total ligans of *Cedrus deodara* pine needles agisnt A549 cell line by using CK-8 assays. The study revealed the inhibitory actions of CTL in a dose dependent manner. CTL was also found to be the inhibitor of HeLa, HepG2, MKN28 and HT-29 cell lines.[100] Chauhan et al., studied the anti-cancerous behaviour of *Cedrus deodara* along with many other important plants in BHK-21 cells by using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay. The results showed that various extracts of the plant exhibited a significant reduction in the cell growth at different concentrations.[101]

Anti-ulcer

Mashaal et al., carried out an *in-vivo* study on ethanol induced ulcer rat models to evaluate the anti-ulcer activity of *Cedrus deodara* root oil. The results showed that the oil at the dosage of 200mg/kg showed anti-ulcer activity with no adverse impacts on kidney and liver tissues.[102]

Anti-leishmanial

Narayan et al., studied the anti-leishmanial activity of *Cedrus deodara* leaf extract in an *in-vitro* test performed on some parasites. The study revealed that the leaf extract with the use of benzene solvent at the dosage of 25-200 ug/ml exhibited remarkable anti-leishmanial activity.[103]

Antidepressant

Kumar et al., evaluated the anti-depressant activity of *Cedrus deodara*n in an *in-vivo* study carried out on experimental albino mice models. The study revealed that the compound isolated from the heart wood of the plant namely 3,4-bis(3,4-dimethoxyphenyl) furan-2,5-dione (BDFD) exhibited an antidepressant activity at the dosage of 100 mg/kg *i.p.* in the forced swim test (FST) with a remarkable reduction in the immobility time whereas in the tail suspension test (TST) the immobility time was not much alerted by the BDFD treatment which suggested the atypical antidepressant action of the compound.[104]

Anti-diabetic and hypoglycemic

Podder et al., studied the anti-diabetic and hypoglycemic activity of *Cedrus deoodara* against alloxan-induced diabetic rat models. The study revealed that the petroleum ether extract of heartwood at the dosage of 400 mg/kg body weight exhibited actions comparable to the standard drug glibenclamide along with a remarkable decrease in the values of glucose tolerance test. whereas a significant decrease in the blood glucose level was noticed with the dosage of 200 and 400 mg/kg body weight.[105] Pradhan et al., carried out an *in-vivo* study to evaluate the effect of petroleum ether extract on the body weight of alloxan-induced diabetic rat models. The study concluded that the administration of the extract doses 200 mg/kg, and 400 mg/kg on 14th and 21st day caused a remarkable decrease in the body weight also the extract dosage of 100 mg/kg on 21st day exhibited action against body weight.[106]

CONCLUSION

Cedrus deodara is a coniferous tree belong to the family *Pinaceae*. The plant has a significant position in the traditional systems of medicine such as Ayurveda and Folk systems where it is used in treatment practices of vast array of diseases. The plant has been explored extensively by many researchers. The present study has summarized the plant in terms of photochemistry and pharmacological properties along with its utilization in the traditional medication

ISSN: 2456-3110 REVIEW ARTICLE July-Aug 2021

systems. The phytochemicals of the plant are associated with many important therapeutic and pharmacological activities. It can be concluded from the study, that *Cedrus deodara* is not just a tree but a plant of great importance to the pharmaceutic as well as the timber industry.

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REFERENCES

1. Zaman T, Syed MS, Isfaq S, Khan MS. Biological activities of stem, leaves and essential oil of Cedrus deodara from district Poonch, Rawalakot Azad Kashmir, Pakistan. Turkish Journal of Agriculture-Food Science and Technology. 2018 Sep 9;6(9):1114-9.
2. Thakur S, Kaurav H, Chaudhary G. Nigella sativa (Kalonji): A Black Seed of Miracle. International Journal of Research and Review. 2021;8(4):342-357.
3. Kumari I, Kaurav H, Chaudhary G. Ethnobotanical Significance of Picrorhiza Kurroa (Kutki), a Threatened Species. International Journal of Research and Review. 2021;8(4):363-75.
4. Kumari I, Kaurav H, Chaudhary G. Myristica fragrans (Jaiphal): A Significant Medicinal Herbal Plant. International Journal for Research in Applied Sciences and Biotechnology. 2021 Apr 7;8(2):213-24.
5. Choudhary S, Kaurav H, Chaudhary G. Vaibidang (Embelia ribes): A Potential Herbal Drug in Ayurveda with Anthelmintic Property. International Journal for Research in Applied Sciences and Biotechnology. 2021 Apr 16;8(2):237-43.
6. Metreveli M, Meskhidze A, Mepharishvili G, Gorgilade L, Koiava L. Antimicrobial Activity of the Himalayan Cedar (Cedrus Deodara Loud.) in Seasonal Dynamics. Bull. Georg. Natl. Acad. Sci. 2020;14(2).
7. Zhang Z, Lyu X, Xu Q, Li C, Lu M, Gong T, Tang B, Wang L, Zeng W, Li Y. Utilization of the extract of Cedrus deodara (Roxb. ex D. Don) G. Don against the biofilm formation and the expression of virulence genes of cariogenic bacterium Streptococcus mutans. Journal of ethnopharmacology. 2020 Jul 15;257(2020):112856.
8. Parveen R, Azmi MA, Tariq RM, Mahmood SM, Hijazi MA, Mahmud SH, Naqvi SN. Determination of antifungal activity of Cedrus deodara root oil and its compounds against Candida albicans and Aspergillus fumigatus. Pak. J. Bot. 2010 Oct 1;42(5):3645-9.
9. Lin CP, Huang JP, Wu CS, Hsu CY, Chaw SM. Comparative chloroplast genomics reveals the evolution of Pinaceae genera and subfamilies. Genome biology and evolution. 2010 Jan 1;2:504-17.
10. Chaw SM, Sung HM, Long H, Zharkikh A, Lie WH. The phylogenetic positions of the conifer genera Amentotaxus, Phyllocladus, and Nageia inferred from 18S rRNA sequences. Journal of molecular evolution. 1995 Aug 1;41(2):224-30.
11. Panetsos KP, Christou A, Scaltsoyiannes A. First analysis on allozyme variation in cedar species (Cedrus sp.). Silvae Genetica. 1992;41(6):339-42.
12. Shinde UA, Phadke AS, Nair AM, Mungantiwar AA, Dikshit VJ, Saraf MN. Membrane stabilizing activity—a possible mechanism of action for the anti-inflammatory activity of Cedrus deodara wood oil. Fitoterapia. 1999 Jun 1;70(3):251-7.
13. Zeng WC, Jia LR, Zhang Y, Cen JQ, Chen X, Gao H, Feng S, Huang YN. Antibrowning and antimicrobial activities of the water-soluble extract from pine needles of Cedrus deodara. Journal of food science. 2011 Mar;76(2):C318-23.
14. Anthwal A, Gupta N, Sharma A, Anthwal S, Kim KH. Conserving biodiversity through traditional beliefs in sacred groves in Uttarakhand Himalaya, India. Resources, Conservation and Recycling. 2010 Sep 1;54(11):962-71.
15. Mahajan D, Bhat ZF, Kumar S. Pine needles (Cedrus deodara (Roxb.) Loud.) extract as a novel preservative in cheese. Food Packaging and Shelf Life. 2016 Mar 1;7(2016):20-25.
16. Patel SJ, Lambole V, Shah P, Shah DP. Pharmacological Activities of Cedrus deodara: An Overview. Pharma Science Monitor. 2013 Apr 16;4(3 Suppl 1):100-14.
17. Agrawal PK, Agarwal SK, Rastogi RP, Österdahal BG. Dihydroflavanonols from Cedrus deodara, A 13C NMR study. Planta medica. 1981 Sep;43(09):82-5.
18. Bisht A, Jain S, Misra A, Dwivedi J, Paliwal S, Sharma S. Cedrus deodara (Roxb. ex D. Don) G. Don: A review of traditional use, phytochemical composition and pharmacology. Journal of Ethnopharmacology. 2021 Jun 22:114361.
19. Viswanatha GL, Nandakumar K. Anxiolytic and Anticonvulsant activity of alcoholic extract of heart wood of Cedrus deodara roxb in rodents. Asian Journal of Pharmaceutical Research and Health Care. 2009;1(2):217-239.
20. Sharma I, Parashar B, Vatsa E, Chandel S, Sharma S. Phytochemical screening and anthelmintic activity of leaves of Cedrus deodara (Roxb.). World J. Pharm. Pharm. Sci. 2016 Jun 15;5(8):1618-28.

21. Zeng WC, Zhang Z, Jia LR. Antioxidant activity and characterization of antioxidant polysaccharides from pine needle (Cedrus deodara). Carbohydrate polymers. 2014 Aug 8;108(2014):58-64.

22. Banumathi V. A Review on Siddha Herbal Formulation Deva Chooranam for Improving The QOL in Acquired Immuno Deficiency Syndrome (AIDS). World Journal of Pharmaceutical Research. 2017;6(5):319-332.

23. Jeeva Gladys R, Kannan KP. Molecular Docking Studies of Deva Chooranam against the Target Protein 6LU7 of Novel Corona Virus 2019. Indo Global Journal of Pharmaceutical Sciences. 2020;10(2):19-25.

24. Zeng WC, Zhang Z, Jia LR. Antioxidant activity and characterization of antioxidant polysaccharides from pine needle (Cedrus deodara). Carbohydrate polymers. 2014 Aug 8;108(2014):58-64.

25. Kumar A, Singh V, Chaudhary AK. Gastric antisecretory and antiulcer activities of Cedrus deodara (Roxb.) Loud. in Wistar rats. Journal of ethnopharmacology. 2011 Mar 24;134(2):294-7.

26. Kar K, Puri VN, Patnaik GK, Sur RN, Dhawan BN, Kulshrestha DK, Rastogi RP. Spasmolytic constituents of Cedrus deodara (Roxb.) Loud: pharmacological evaluation of himachalol. Journal of pharmaceutical sciences. 1975 Feb 1;64(2):258-62.

27. Zeng WC, He Q, Sun Q, Zhong K, Gao H. Antibacterial activity of water-soluble extract from pine needles of Cedrus deodara. International journal of food microbiology. 2012 Feb 1;153(1-2):78-84.

28. Ramesh C, Krishnadas N, Radhakrishnan R, Rangappa S, Viswanatha GL, Rajesh D, Gopal M, Talwar S. Anti-urolithiatic activity of heart wood extract of cedrus deodara in rats. Journal of Complementary and Integrative Medicine. 2010 Apr 7;7(1).

29. Ahmed S, Hasan MM, Mahmood ZA. Antiurolithiatic plants: Multidimensional pharmacology. Journal of Pharmacognosy and Phytochemistry. 2016 Mar 1;5(2):4.

30. Patil S, Prakash T, Kotresha D, Rao NR, Pandy N. Antihyperlipidemic potential of Cedrus deodara extracts in monosodium glutamate induced obesity in neonatal rats. Indian journal of pharmacology. 2011 Nov;43(6):644.

31. Singh AP. Promising phytochemicals from Indian medicinal plants. Ethnobotanical leaflets. 2005;2005(1):18.

32. Shinde UA, Phadke AS, Nair AM, Mungantiwar AA, Dikshit VJ, Saraf MN. Preliminary studies on the immunomodulatory activity of Cedrus deodara wood oil. Fitoterapia. 1999 Aug 1;70(4):333-9.

33. Singh R, Upadhyay SK, Tuli HS, Singh M, Kumar V, Yadav M, Aggarwal D, Kumar S. Ethnobotany and herbal medicine: Some local plants with anticancer activity. Bulletin of Pure and Applied Sciences. 2020;39(1):57-64.

34. Marrelli M, Amodeo V, Perri MR, Conforti F, Statti G. Essential Oils and Bioactive Components against Arthritis: A Novel Perspective on Their Therapeutic Potential. Plants. 2020 Oct;9(10):1252.

35. Tamta S, Palni LM. Studies on in vitro propagation of Himalayan cedar (Cedrus deodara) using zygotic embryos and stem segments. Indian Journal of Biotechnology. 2004;3:209-15.

36. Khanduri VP, Sharma CM. Pollen production, microsporangium dehiscence and pollen flow in Himalayan cedar (Cedrus deodara Roxb. ex D. Don). Annals of Botany. 2002 May 1;89(5):587-93.

37. Khanduri VP, Sharma CM. Cyclic pollen production in Cedrus deodara. Sexual plant reproduction. 2009 Jun;22(2):53-61.

38. Afzal S, Afzal N, Awan MR, Khan TS, Gilani A, Khanum R, Tariq S. Ethno-botanical studies from Northern Pakistan. J Ayub Med Coll Abbottabad. 2009 Mar 1;21(1):52-7.

39. Hanif M, Khalid AN, Sarwer S. Additions to the Ectomycorrhizae Associated with Himalayan Cedar (Cedrus deodara) using rDNA-ITS. International journal of agriculture & biology. 2012 Feb 1;14(1):101-6.

40. Manandhar NP. Ethnobotany of Jumla District, Nepal. International Journal of Crude Drug Research. 1986 Jan 1;24(2):81-9.

41. Gupta S, Walia A, Malan R. Phytochemistry and pharmacology of cedrus deodera: an overview. International Journal of Pharmaceutical Sciences and Research. 2011 Aug 1;2(8):2010.

42. Jain S, Jain A, Vaidya A, Kumar D, Jain V. Preliminary phytochemical, pharmacognostical and physico-chemical evaluation of Cedrus deodara heartwood. Journal of Pharmacognosy and Phytochemistry. 2014 May 1;3(1):91-5.

43. Bhardwaj K, Islam MT, Jayasena V, Sharma B, Sharma S, Sharma P, Kuča K, Bhardwaj P. Review on essential oils, chemical composition, extraction, and utilization of some conifers in Northwestern Himalayas. Phytotherapy Research. 2020 Nov;34(11):2889-910.

44. Sharma S, Sharma S, Pradhan P, Pathak S, Sharma M. Development, standardization of polyherbal formulation of analgesic ointment of plant Carum copticum, Mentha piperita, Cedrus deodara. Journal of Applied Pharmaceutical Research. 2020 Mar 30;8(1):29-43.

45. Chaudhary AK, Ahmad S, Mazumder A. Cedrus deodara (Roxb.) Loud.: a review on its ethnobotany, phytochemical and pharmacological profile. Pharmacognosy Journal. 2011 Jul 1;3(23):12-7.

ISSN: 2456-3110 **REVIEW ARTICLE** July-Aug 2021

46. Xu F, Gu D, Wang M, Zhu L, Chu T, Cui Y, Tian J, Wang Y, Yang Y. Screening of the potential α-amylase inhibitor in essential oil from Cedrus deodara cones. Industrial Crops and Products. 2017 Sep 1;103(2017):251-6.
47. Dhaundiyal A, Hanon MM. Calculation of kinetic parameters of the thermal decomposition of residual waste of coniferous species: Cedrus Deodara. Acta Technologica Agriculturae. 2018;21(2):76-81.
48. Thakur R, Tomar M. Integrated anagement of eedling oot ot of M S R R Cedrus deodara Caused by Binucleate AG-E in Himachal Pradesh Rhizoctonia. J Mycol Pl Pathol. 2020;50(2):168-177.
49. Shinde UA, Kulkarni KR, Phadke AS, Nair AM, Mungantiwar AA, Dikshit VJ, Saraf MN. Mast cell stabilizing and lipoxygenase inhibitory activity of Cedrus deodara (Roxb.) Loud. wood oil. Indian Journal of Experimental Biology. 1999;37:258-261.
50. Kadam AA, Singh S, Gaikwad KK. Chitosan based antioxidant films incorporated with pine needles (Cedrus deodara) extract for active food packaging applications. Food Control. 2021 Jun 1;124:107877.
51. Shivanand P, Viral D, Manish G, Subhash V, Jaganathan K. Formulation and evaluation of cedrus deodara loud extract. Int J Chem Tech Res. 2009;1(4):1145-52.
52. Selvi S, Devi PU, Chinnaswamy P, Giji TM, Sharmila SP. Antibacterial efficacy and phytochemical observation of some Indian medicinal plants. Ancient science of life. 2007 Jan;26(3):16.
53. Kumar S, Kumar A, Kumar R. Himalayan (Himachal region) cedar wood (Cedrus deodara: Pinaceae) essential oil, its processing, ingredients and uses: A review. J. Pharmacogn. Phytochem. 2019;8(1):2228-38.
54. Nam AM, Bighelli A, Ghanmi M, Satrani B, Casanova J, Tomi F. Deodarone Isomers in Cedrus atlantica Essential Oils and Tar Oils. Natural product communications. 2015 Nov;10(11):1905-6.
55. Bhardwaj K, Silva AS, Atanassova M, Sharma R, Nepovimova E, Musilek K, Sharma R, Alghuthaymi MA, Dhanjal DS, Nicoletti M, Sharma B. Conifers Phytochemicals: A Valuable Forest with Therapeutic Potential. Molecules. 2021 Jan;26(10):3005.
56. Zhang JM, Shi XF, Ma QH, He FJ, Fan B, Wang DD, Liu DY. Chemical constituents from pine needles of Cedrus deodara. Chemistry of Natural Compounds. 2011 May;47(2):272-4.
57. Ohmoto T, Kanatani K, Yamaguchi K. Constituent of pollen. XIII. Constituents of Cedrus deodara Loud.(2). Chemical and pharmaceutical bulletin. 1987 Jan 25;35(1):229-34.
58. Wu YP, Liang X, Liu XY, Zhong K, Gao B, Huang YN, Gao H. Cedrus deodara pine needle as a potential source of natural antioxidants: Bioactive constituents and antioxidant activities. Journal of functional foods. 2015 Apr 1;14:605-12.
59. Wu Y, Bai J, Zhong K, Huang Y, Qi H, Jiang Y, Gao H. Antibacterial activity and membrane-disruptive mechanism of 3-p-trans-coumaroyl-2-hydroxyquinic acid, a novel phenolic compound from pine needles of Cedrus deodara, against Staphylococcus aureus. Molecules. 2016 Aug;21(8):1084.
60. Agrawal PK, Rastogi RP. Two lignans from Cedrus deodara. Phytochemistry. 1982 Jan 1;21(6):1459-61.
61. Liu DY, Shi XF, Wang DD, He FJ, Ma QH, Fan B. Two new myricetin glycosides from pine needles of Cedrus deodara. Chemistry of Natural Compounds. 2011 Nov;47(5):704-7.
62. Chaudhary A, Sood S, Kaur P, Kumar N, Thakur A, Gulati A, Singh B. Antifungal sesquiterpenes from Cedrus deodara. Planta medica. 2012 Jan;78(02):186-8.
63. Kumar A, Suravajhala R, Bhagat M. Bioactive potential of Cedrus deodara (Roxb.) Loud essential oil (bark) against Curvularia lunata and molecular docking studies. SN Applied Sciences. 2020 Jun;2(6):1-9.
64. Saab AM, Gambari R, Sacchetti G, Guerrini A, Lampronti I, Tacchini M, El Samrani A, Medawar S, Makhlouf H, Tannoury M, Abboud J. Phytochemical and pharmacological properties of essential oils from Cedrus species. Natural product research. 2018 Jun 18;32(12):1415-27.
65. Chung I, Lim J, Yu B, Kim S, Ahmad A. Chemical composition of the essential oil and petroleum ether extract from Korea pine needle leaves of Cedrus deodara. Asian Journal of Chemistry. 2014;26(10):3029-32.
66. Gao Y, Jin YJ, Li HD, Chen HJ. Volatile organic compounds and their roles in bacteriostasis in five conifer species. Journal of Integrative Plant Biology. 2005 Apr;47(4):499-507.
67. Lee NH, Lee SM, Lee TM, Chung N, Lee HS. GC-MS analyses of the essential oils obtained from Pinaceae leaves in Korea. Journal of Essential Oil Bearing Plants. 2015 May 4;18(3):538-42.
68. Chaudhary A, Kaur P, Singh B, Pathania V. Chemical composition of hydrodistilled and solvent volatiles extracted from woodchips of Himalayan Cedrus: Cedrus deodara (Roxb.) Loud. Natural product communications. 2009 Sep;4(9):1257-60.
69. Choudhary S, Chaudhary G. Sandalwood (Santalum Album): Ancient Tree with Significant Medicinal Benefits. International Journal of Ayurveda and Pharma Research. 2021;9(4):90-9.
70. Naik HR, Jhadav V. An Ayurvedic Review on Medicinal Inportant of Devdaru Plant. National Journal of Research in Ayurved Science. 2020;8(4):1-4.

71. Singh PL, Tripathi K, Yadav RB, Yadav KN. Devadaru (Cedrus deodara (Roxb.) Loud.): a critical review on the medicinal plant. Int J Ayurveda Pharm Res. 2014;2(1):1-10.

72. Joshi Gauri A, Kulkarni Yogini R. Critical Analysis of Pramehaghna dravyas on the basis of Rasapanchaka. Annals of Ayurvedic Med. 2013;2(4):168-75.

73. Sharma PV. Dravyagun Vigyan. Vol 2. Varanasi, Chaukambha Bharti Academy. 2019.

74. Mohammad H, Prabhu K, Rao MR, Sundaram RL, Shil S, Vijayalakshmi N. The GC MS study of one Ayurvedic medicine, Khadirarishtam. Research Journal of Pharmacy and Technology. 2019;12(2):535-40.

75. Khanal H, Joshi RK, Upadhyay A. A Review of an Ayurvedic Polyherbal Formulation Mustadi Kwatha. Journal of Drug Delivery and Therapeutics. 2020 Oct 15;10(5-s):267-72.

76. Bibi T, Ahmad M, Tareen RB, Tareen NM, Jabeen R, Rehman SU, Sultana S, Zafar M, Yaseen G. Ethnobotany of medicinal plants in district Mastung of Balochistan province-Pakistan. Journal of ethnopharmacology. 2014 Nov 18;157(2014):79-89.

77. Bhattarai N. Medical ethnobotany in the Karnali Zone, Nepal. Economic Botany. 1992;46(3):257-261.

78. Kunwar R, Uprety Y, Burlakoti C, Chowdhary C, Bussmann R. Indigenous Use and Ethnopharmacology of Medicinal Plants in Far-West Nepal. Ethnobotany Research and Applications. 2009;7:5-28.

79. Kumar M, Paul Y, Anand VK. An ethnobotanical study of medicinal plants used by the locals in Kishtwar, Jammu and Kashmir, India. Ethnobotanical leaflets. 2009;2009(10):1240-56.

80. Khan M, Kumar S, Hamal IA. Medicinal plants of Sewa River catchment area in the northwest Himalaya and its implication for conservation. Ethnobot. Leafl. 2009;13(2009):1113–1139.

81. Mehra A, Bajpai O, Joshi H. Diversity, utilization and sacred values of Ethno-medicinal plants of Kumaun Himalaya. Tropical Plant Research. 2014;1(3): 80–86.

82. Rana CS, Sharma A, Kumar N, Dangwal LR, Tiwari JK. Ethnopharmacology of Some Important Medicinal Plants of Nanda Devi National Park (NDNP) Uttarakhand, India. Nature and Science. 2010;8(11):9-14.

83. Gamage DG, Dharmadasa RM, Abeysinghe DC, Wijesekara RG, Prathapasinghe GA, Someya T. Emerging Herbal Cosmetic Production in Sri Lanka: Identifying Possible Interventions for the Development of the Herbal Cosmetic Industry. Scientifica. 2021 Mar 10;2021:1-12.

84. Khan N, Ahmed M, Ahmed A, Shaukat SS, Wahab M, Ajaib M, Siddiqui MF, Nasir M. Important medicinal plants of chitral gol National park (cgnp) Pakistan. Pak. J. Bot. 2011 Apr 1;43(2):797-809.

85. Kaurav H, Chaudhary S, Chaudhary G. Syzygium cumini (jamun): Antidiabetic fruit plant with significant ayurvedic and therapeutic properties. World Journal of Pharmacy and Pharmaceutical Sciences. 2021;10(6):656-676.

86. Manikandan PA. Folk herbal medicine: A survey on the paniya tribes of Mundakunnu village of the Nilgiri hills, South India. Ancient Science of life, 2005 Jul; 25(1): 21.

87. Kumar SP. Adulteration and substitution in endangered ASU medicinal plants of India: a review. Int J Med Arom Plants, 2014 Mar; 4(1): 56- 73.

88. Thakur S, Walia B, Chaudhary G. Dalchini (cinnamomum zeylanicum): a versatile spice with significant therapeutic potential. International Journal of Pharmaceutics and Drug Analysis. 2021;9(2):126-136.

89. Kumari I, Chaudhary G, Kaurav H. Folkloric significance of anti-urolithic plant Createva nevula Buch Ham (Varuna). International Journal of Pharmaceutical Science and Health Care. 2021;3(11):7-20.

90. Thakur R, Bhart C, Panwar K, Arya V. Indigenous volatile oils as imperative gift from nature-a review. International Journal of Ayurveda and Pharma Research. 2018;6(10):54-64.

91. Kumari I, Chaudhary G. Calotropis procera (Arka): A Tribal Herb of Utmost Significance. International Journal for Research in Applied Sciences and Biotechnology. 2021 May 27;8(3):44-54.

92. Ramzan M, Obodo RM, Shahzad MI, Mukhtar S, Ilyas SZ, Mahmood T. Green synthesis of Cu@ TiO2 via cedrus deodara leaf extract: A novel composite with high photocatalytic and antibacterial activity. Current Research in Green and Sustainable Chemistry. 2021 Jul 2;4:100137.

93. Wu Y, Bai J, Liu X, Liu L, Zhong K, Huang Y, Gao H. Antibacterial effect of 3-p-trans-coumaroyl-2-hydroxyquinic acid, a phenolic compound from needles of Cedrus deodara, on cellular functions of Staphylococcus aureus. RSC advances. 2018;8(9):4969-75.

94. Wu Y, Bai J, Zhong K, Huang Y, Gao H. A dual antibacterial mechanism involved in membrane disruption and DNA binding of 2R, 3R-dihydromyricetin from pine needles of Cedrus deodara against Staphylococcus aureus. Food Chemistry. 2017 Mar 1;218:463-70.

95. Chandur U, Shashidhar S, Chandrasekar SB, Rao MN. Studies of preliminary phytochemical and anti-arthritic activity of heart wood of Cedrus deodar (Roxb.). RJPBCS. 2011;2(3):654-0.

96. Manne HS, Basavaraju B, Bindhu V, Keerthi S, Vernekar NN, Laturkar V. Study of Anti-inflammatory and Analgesic Activity

ISSN: 2456-3110 **REVIEW ARTICLE** July-Aug 2021

of Methnaolic Extracts of Cedrus deodara. Biotechnology An Indian Journal. 2008;2(1):1-4.

97. Shinde UA, Phadke AS, Nair AM. Studies on the anti-inflammatory and analgesic activity of *Cedrus deodara* (Roxb.) Loud. Wood oil. Journal of Ethnopharmacology. 1999;65(1):21-7.

98. XU QD, Zhou ZQ, HE Q, Sun Q, Zeng WC. Antioxidant Activity and Structure-Activity Relationship of Ethanol Extract from Pine Needle of Cedrus deodara. Science and Technology of food industry. 2020 Nov 12;41(20):295-302.

99. Jain S, Jain A, Malviya N, Kumar D, Jain V, Jain S. Antidiabetic activity of Cedrus deodara aqueous extract and its relationship with its antioxidant properties. Journal of Pharmaceutical Sciences and Pharmacology. 2014 Sep 1;1(3):187-94.

100. Shi X, Du R, Zhang J, Lei Y, Guo H. Evaluation of the anti-cancer potential of Cedrus deodara total lignans by inducing apoptosis of A549 cells. BMC complementary and alternative medicine. 2019 Dec;19(1):1-7.

101. Chauhan RS, Joshi A. Anti-Cancer properties of herbs in cell culture system. Journal of Immunology and Immunopathology. 2018;20(si):107-20.

102. Mashaal K, Perveen R, Zia Z, Mahmood SM, Minhas K, Ibrahim S, Naeem H. Histopathological effects on stomach, liver and kidney associated with Cedrus deodara root oil in ulcer induced rats (Wistar strain). Pakistan Journal of Pharmaceutical Sciences. 2020 Nov 1;33(6):2483-88.

103. Narayan S, Thakur CP, Bahadur S, Thakur M, Pandey SN, Thakur AK, Mitra DK, Mukherjee PK. Cedrus deodara: In vitro antileishmanial efficacy & immumomodulatory activity. The Indian journal of medical research. 2017 Dec;146(6):780.

104. Kumar N, Dhayabaran D, Nampoothiri M, Nandakumar K, Lalani AP, Dawood, et al., Atypical Antidepressant Activity of 3,4-Bis(3,4-Dimethoxyphenyl) Furan-2,5-Dione Isolated from Heart Wood of *Cedrus deodara*, in Rodents. Korean J Physiol Pharmacol. 2014 Oct;18(5):365-369.

105. Podder S, Pradhan G, Mahapatra SC. Evaluation of petroleum ether heartwood extract of Cedrus deodara in healthy and diabetic rats. Int J Clin Exp Physiol. 2016 Apr 30;3(2):72-6.

106. Pradhan G, Podder S, Mahapatra SC. Effect of petroleum ether extract of Cedrus deodara on body weight in diabetic rats. International Journal of Clinical and Experimental Physiology. 2016 Jul 1;3(3):140-3.

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