



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

International Journal of Current Research  
Vol. 10, Issue, 02, pp.65758-65762, February, 2018

INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

## RESEARCH ARTICLE

### CEDRUS DEODARA: A MEDICINAL HERB

<sup>1,\*</sup>Amit Sharma, <sup>2</sup>Bharat Prashar and <sup>3</sup>Pankaj Arora

<sup>1</sup>Madhav University, P.O. Bharja, Tehsil, Pindwara, District: Sirohi, Rajasthan- 307026

<sup>2</sup>Department of pharmacy Manav Bharti University Laddo, Kumarhatti, Solan, H.P- 173229

<sup>3</sup>Pankaj Arora Faculty of Pharmaceutical sciences, Madhav University, P.O. Bharja, Tehsil, Pindwara, District: Sirohi, Rajasthan- 307026

#### ARTICLE INFO

##### Article History:

Received 19<sup>th</sup> November, 2017

Received in revised form

23<sup>rd</sup> December, 2017

Accepted 15<sup>th</sup> January, 2018

Published online 28<sup>th</sup> February, 2018

##### Key words:

Traditional Medicine,  
Ayurvedic, Ornamental,  
Pharmaceutical Value, Deodara.

#### ABSTRACT

Many plants are important to cure various human ailments. India has a rich source of naturally occurring herbal plants which have huge as well as great pharmacological functions. A lot of medicinal plants are used in treating various disorders. Herbal medicines play a vital role in Ayurvedic, homeopathic, Oriental and Native American Indian medicine. Various pharmaceutical companies conducting extensive research on plant materials which have high potential value. *Cedrus deodara* commonly called as cedar is precious plant belonging to family *pinaceae*. *Cedrus deodara* is a medicinal herb with a lot of beneficial as well as pharmacological activities which prove to be a boon in solving various health issues

**Copyright © 2018, Amit Sharma et al.** This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Citation:** Amit Sharma, Bharat Prashar and Pankaj Arora, 2018. *Cedrus deodara: A Medicinal Herb*, International Journal of Current Research, 10, (02), 65758-65762.

## INTRODUCTION

Nature acts as one of the outstanding source of herbal medicine. Nature has provided a full as well as a complete package for various remedies to cure all ailments of man and his life. Major portion of our population depends upon these herbal medicines. Either as a part of plant or as entire plant or as a whole growing plant, these herbal medicines are turning to give a lot of important medicinal uses with fewer side effects. Traditional use of these medicinal plant acts as a way to learn more about potential features of herbal medicines. Herbal plants have provided a good source or huge variety of essential components like phenolic compounds, nitrogen compounds, vitamins, terpenoids and some other secondary metabolites, which are rich in antioxidant, anti-inflammatory, antitumor, antibacterial, anti viral and various other activities. Herbal plants have now become the target of chemists, biochemists and pharmacists. The research of these play a vital role for discovering and developing new drugs which are medicinal in nature that hopefully have lesser side effects but show more effectiveness. Medicinal plants also have non medicinal uses such as flavors, foods and ornamentals species etc (Kunin, 1996; Pieroni *et al.*, 2004).

**\*Corresponding author: Amit Sharma,**

Madhav University, P.O. Bharja, Tehsil, Pindwara, District: Sirohi, Rajasthan- 307026.

The World health Organization (WHO) assumed that 4 billion people, 80 percent of population use medicinal drug for various health issues. Many pharmaceutical companies now a days working on these plants which are being collected either from rain forest or from other places rich in medicinal herbs. There are number of plants derived pharmaceuticals medicines which are highly used in modern medicines with their traditional uses. These medicinal plants are timely used by many people for curing various types of ailments (Mukherjee, 2003; Chaudhri, 1996; Patwardhan, 1992; Jogne, 1996). There are many different types of systems of medicines in India like Ayurveda, Siddha, Unani and various local health traditions, use various number of plants for the treatment of various diseases of mankind (Jain, 1991; Chatterjee, 1991; Anonymous, 1985; Chopra, 1956). A lot of plants are used in treating various disease conditions they may be in the form of tonics, anti-malarial, antipyretics, aphrodisiacs, expectorants, hepato-protective, anti-rheumatics, diuretics etc. A modern trend has been observed in the research of these medicinal plants. Export import report suggests that the trade of plant and plant derived products in the global market is around US \$60 billion. As it is well known that India, with its rich-biodiversity and rich traditional systems provides a strong base for a large number of plants which can be utilized in health care and common health problems of people.

In present time allopathic medicines showing lot of side effects which are very severe so it is very important to find out some herbal medicines for treating diseases. *Cedrus deodara* is an evergreen tree (conifer) with a height of 85 m, almost rough black, bark and spreading branches, shoots with dimorphic leaves 2-8 cm needle like with sharp pointed, flowers are monoecious, but some branches Bear flowers with one sex. All the parts of the flower are bitter, pungent, in nature. *Cedrus* is a genus of Pinacea with tropical as well as subtropical distribution. The genus is mainly comprised of trees which are cultivated may be for their usefulness for their ornamental purposes. Seeds usually shed in winter season. Deodara trees live up to 600 years. Flowers come in September to October. Drained soil is well for the growth of these trees. High moisture is favorable for the growth of the plant. Cold wind and frosts may cause injury to young trees (Mukherjee, 2013).

The first half of plant name that is word Deva means divine, deity, Deus and the second part means durum, tree and true. Forest with devadaru trees was the favorite place of ancient sages who were devoted to Hindu god Shiva. So this plant believed to be a sacred tree. In India total deodara forest are 2,03,263 a comprising of 69,8721 20,391,1,13,000 ha in Himachal Pradesh, Uttar Pradesh and Jammu and Kashmir (Tiwari, 1994).



Fig. 1. *Cedrus Deodara*

### Taxonomical classification

Division: Pinophyta  
Kingdom: Plantae  
Class: Pinopsida  
Order: Pinales  
Family: Pinaceae  
Genus: *Cedrus* S  
Species: *C. deodara*

### Synonyms

Synonyms of this plant are *Cedrus deodara* (latin), deodar, Himalaya cedar (english), devdaar, diar, diyar (hindi), devdaru, amara, devahvaya (sanskrit), devdaar (gujrati), deodar (marathi), devadaru, devadaram, devataram (malyalam), bhadraaru, daevadaaru, gunduguragi (kannad), burada deodar, deodar (urdu), than sin, than-sin (tibetan), devadaram, tevataram, tunumaram (tamil), and devadaru (nepali).

According to Ayurveda plant *Cedrus deodara* is having various essential magical and important features like: Gunna (properties) - laghu (light) and snigdha (slimy), Rasa (taste)-tikt (bitter), Virya (potency)-ushan (hot)

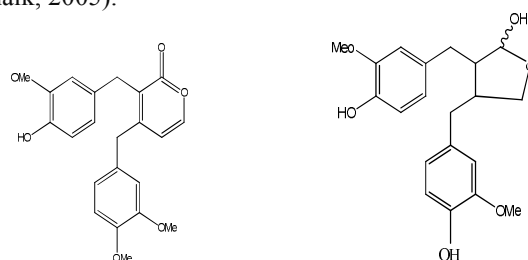
Table 1. Chemical composition of plant (Gupta, 2011)

Element	Percentage
C (Organic Carbon)	83.50
N (Nitrogen)	0.28
P (Phosphorus)	0.055
K (Potassium)	0.60
Ca (Calcium)	2.60
Mg (Magnesium)	0.017

All parts of plant useful in curing diseases like inflammation, insomnia, cough, fever, urinary discharges, itching, tuberculosis, ophthalmic disorders, disorders of mind, diseases of the skin and of the blood. The leaves of these plant help in reducing inflammation. The wood act as expectorant and useful in curing piles, epilepsy, stones in the kidney and bladder, useful in fevers and in many other disorders. The oil is antiseptic in nature and helpful in curing skin diseases, wounds, urogenital diseases, diaphoretic as well as insecticide. It may also cure fungal diseases and act as sedative and cardio tonic too (Sharma et al., 2016)

### Chemical constituents

*Cedrus deodara* has been studied by lot of researcher and they concluded that there are lot of essential constituents of high range of structure are seen in figure 2. The chemicals in wood are wickstromal, matairesinol, dibenzylbutyrolactol, 1, 4 diaryl butane, benzofuranoid neo lingam (Agrawal, 1982), cedrin (6-methyldihydromyricetin), taxifolin, cedeodarin (6-methyltaxifolin), dihydromyricetin, cedrinoside (Agrawal, 1980), deodardione, diosphenol, limonenecarboxylic acid (Krishnappa, 1978), (-)-matairesinol, (-)-nortrachelogenin, and a dibenzylbutyrolactollignan (4, 4', 9-trihydroxy-3, 3'-dimethoxy-9, 9'-epoxylignan) (Tiwari et al., 2001). A new dihydroflavonol named deodarin (3, 4, 5, 6-tetrahydroxy-8-methyl dihydroflavonol) has been isolated from the stem bark (Adinarayana et al., 2001). The extract of *Cedrus deodara* needle (ethanolic extract) showed the presence of lot of compounds viz. 10-nonacosanol, dibutyl phthalate, protocatechuic acid, phthalic acid bis-(2-ethylhexyl) ester, (E)-1-O-p-coumaroyl-beta-D-glucopyranoside and 5-p-trans-coumaroylguinic acid, 9-hydroxy-dodecanoic acid, ethyl laurate, ethyl stearate, 3-beta-hydroxy-oleanolic acid methyl ester, beta-sitosterol, shikimic acid, methylconiferin and ferulic acid beta-glucoside (Zhang et al., 2010; Zhang et al., 2010). The essential oil of wood contain a sesquiterpenes-L II: isohemacholone and sesquiterpenes L III: deodarone, atlantone (Shankaranarayan, 1977),  $\alpha$ -himacholone,  $\beta$  himacholone (Gulati, 1977; Kar et al., 1975),  $\alpha$ -pinene,  $\beta$ -pinene, myrcene (Yan-qiu et al., 2008), himachalene, cis-atlantone,  $\alpha$  atlantone (Makhaik, 2005).



(-) Matairesinol

Dibenzylbutyrolactol

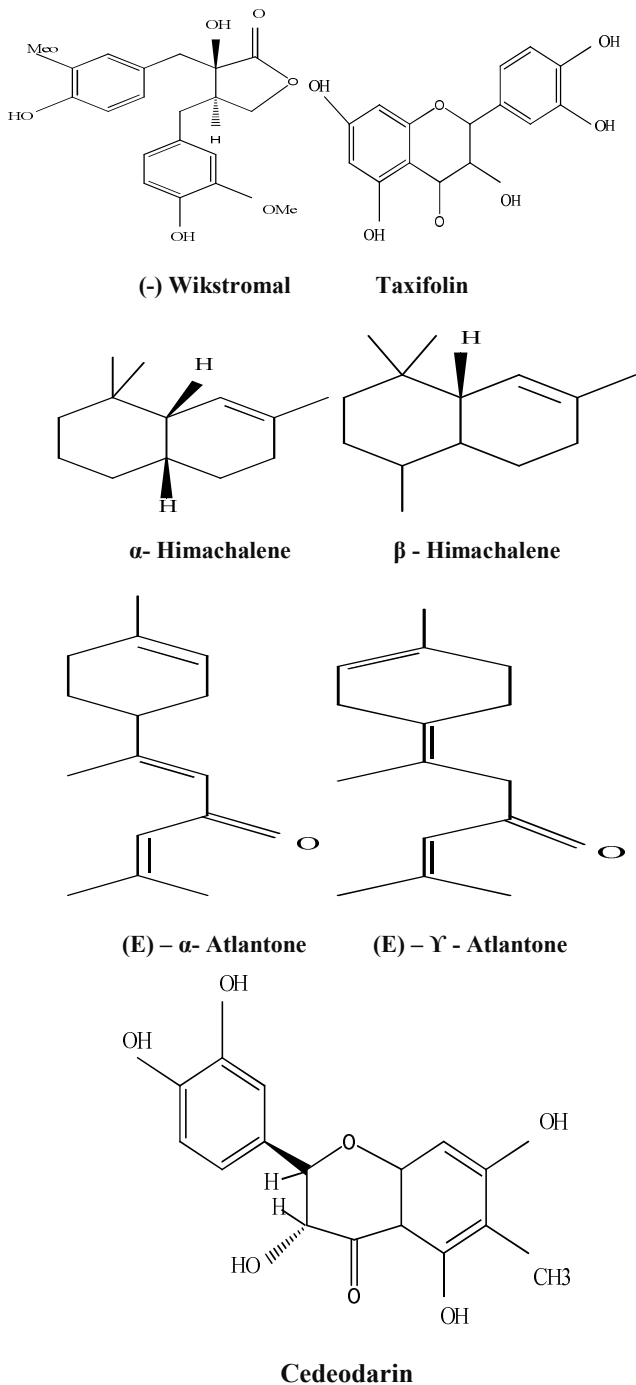


Fig. 2.

### Pharmacological Activity

Many pharmacological activities of *Cedrus deodara* have been reported in-vivo and in-vitro. Various parts of this plant bear anti-inflammatory, immuno modulatory, antispasmodic, anti-cancer, anti-apoptotic, anti-bacterial as well as other activities.

#### Anti-inflammatory activity

The oil extract of wood was used for its oral anti-inflammatory activity. The extract showed significant result in induced rat paw edema process. The oil extract (Volatile) was also studied for its anti-inflammatory activity by the process of induced arthritis. The extract showed significant result here too (Winter *et al.*, 1962; Newbould, 1963).

#### Analgesic activity

The oil of wood of *Cedrus deodara* was studied for its analgesic potential by acetic acid induced writhing response

and hot plate reaction time model in mice. Aspirin and morphine were used as reference control for study. Wood oil of *Cedrus deodara* showed significant analgesic activity in both levels of study (Shinde *et al.*, 1991).

#### Immunomodulatory activity

Models like neutrophil adhesion test in rats were used for studying volatile oil of wood of *Cedrus deodara* in immunomodulatory activity (Wilkinson, 1962). Reaction of Arthus reaction in mice (Goldlust, 1978), SRBC- induced delay type hypersensitivity (DTH) in mice (Saraf *et al.*, 1989; Ray *et al.*, 1991) and oxazolone-induced contact hypersensitivity in mice (West, 1982). *Cedrus deodara* oil of wood helps in inhibiting the adhesion of neutrophils to nylon fibers which are responsible for the simulation of blood vessels in the cells (margination). This shows that the *Cedrus deodara* wood oil lessens the amount of neutrophils in turn decreasing phagocytosis action and also the release of various enzymes that make inflammation even more worse (Ray *et al.*, 1991).

*Cedrus deodara* wood oil significantly shows the inhibition for Arthus reaction due to inhibitory effect characterized in the following reaction: Formation of precipitation of an immune complex at the site of injection, Activation of compliment system, neutrophil aggregation, release of lysosomal enzymes etc (Rodnan, 1989). In the early event hypersensitivity reaction to oxazolone, mast cell degranulation has been reported (Thomas, 1980). It is due to mast cell stabilization. This proved that *Cedrus deodara* oil manly of wood produces and inhibitory effects on humoral as well as cell-mediated immune responses and hence shows lot of usefulness in curing inflammatory diseases.

#### Antispasmodic Activity

Himachalol is one of the chief constituent of wood of *Cedrus deodara*, which likely to have antispasmodic activity. The pharmacological studies of himachalol on different isolated smooth muscles (rat uterus, pig ileum and rabbit jejunum) and against various other agonists histamine, serotonin, nicotine, acetylcholine etc proved spasmolytic activity. This antagonist activity had no relaxing effect when given alone. Himachalol had much faster and better action as compare to papaverine which compared to Himachalol. Intravenous injection of Himachalol when given to cat produces a dose dependent fall in blood pressure and also causes an increased femoral blood flow (Kar *et al.*, 1975).

#### Antioxidant Activity

Brain and nervous system are mainly the two parts of our body which are highly prone to free radical damage as our nervous system and brain are rich in lipid and iron. *Cedrus deodara* was known and also evaluated to have high antioxidant property (Halliwell *et al.*, 1989). Fractionation and purification are the two processes which are involved in the identification of antioxidant components mainly from dried heart wood powder of *Cedrus deodara*.

#### Anti-malarial activity

Oil from the *Cedrus deodara* was studied for bioactivity against the adults of *Culexquinue fasciatus* and *Aedes aegypti*. Various Wood chips of *Cedrus deodara* were used to get essential oils which are useful in anti malarial activity.

There is an apparatus use to crush wood chips to get essential oils is Clevenger's. Adults of *A. aegypti* were mostly insensitive to essential oil of *Cedrus deodara*. Plants showed moderate activity (Makhaik, 2005).

#### Anti-allergic activity

Various Phytochemical investigations proved that various medicinal as well as essential constituents of the plant are responsible for curing different diseases e.g. himachalol is one of the best constituent with anti-allergic property (Singh, 1988).

#### Insecticidal activity

Himalayan cedar wood oil fractions and chromatograph were bio assayed against the pulse beetle (*Callosobruchus analis* F.) and the housefly (*Musca domestica* L.). All fractions showed insecticidal activity. Evaluation of fractions I and V and  $\beta$ -himachalene (naturally occurring) sesquiterpenes indicated mortality against the pulse beetle. These natural products of plant serve suitable for the development of commercial insecticides (Singh, 1988).

#### Anti-hyperglycemic activity

The ethanolic extract of wood of *Cedrus deodara* possesses antihyperglycemic activity mainly on streptozotocin-induced diabetic rats from 1 to 7 h. Lowering of blood pressure was found at 7 h treatment (Ahmad, 2008). Plant shows 6% fall in blood glucose profile in single dose experiment on streptozotocin-induced diabetic rats (Gupta, 2005; Rajasekaran et al., 2004; Upadhyaya et al., 2004). Antihyperglycemic preparation was also obtained and evaluated from the ethanolic extract of *Cedrus deodara* (Shivanand, 2009).

#### Antisarcoptic mange activity

*Cedrus deodara* proved to contain two commonly acaricidal drugs that are OCD and benzyl benzoate (BB), respectively, which are used to cure infection of Sarcoptesmites. These drugs are applied on effected part in alternative days and recoveries in skin lesions were observed. Blood samples were also collected and analyzed after every 10 days of Post treatment (PT). *Cedrus deodara* oil was more effective in controlling sarcoptic mange in sheep (Sharma et al., 1997).

#### Anticonvulsant activity

Alcoholic extract of heart wood of plant *Cedrus deodara* was studied for its highly anticonvulsant activity by Pentylentetrazole (PTZ) induced and maximal electro shock (MES) induced in mice. The alcoholic extract showed increase in the onset of tonic seizures in PTZ and also decrease in the time of tonic extensor phase in MES. Modulation of GABA level were estimated when administered in rat brain and showed significant result. This proves that alcoholic extract of *Cedrus deodara* have significant anticonvulsant activity through GABA levels in brain (Dhayabaran, 2010; Viswanatha et al., 2009).

## DISCUSSION AND CONCLUSION

Herbal medicines are considered as a rich source of medicines which can be used in drug development and synthesis.

These herbal medicines play an important role in the development of human culture around the whole world. Herbal medicines have been proved better and even best against allopathic medicines. From the present review it is clear that *Cedrus deodara* have many qualities and features including anti-inflammatory, antitumor, anti-bacterial, antifungal and various other and possesses great influence on nervous system. Various studies can be conducted in multiple animal based models for understanding their mechanism of action.

## REFERENCES

- Adinarayana D, Seshadri TR. Chemical investigation of the stem-bark of *Cedrus deodara*: Isolation of a new dihydroflavonol, deodarin. *Tetrahedron* 21:3727-30,2001.
- Agrawal PK, Agarwal SK, Rasgi RP. 1980. Dihydroflavonoids from *Cedrus deodara*. *Phytochemistry* 19:893-896.
- Agrawal PK, Rastogi RP. 1982. Two lignans from *Cedrus deodara*. *Phytochemistry* 21:149-146.
- Ahmad R, Srivastava PS, Maurya R, Rajendran SM, Aryan KR, Srivastava AK. 2008. Mild antihyperglycaemic activity in *Eclipta alba*, *Berberis aristata*, *Betula utilis*, *Cedrus deodara*, *Myristica fragrans* and *Terminalia chebula* Indian. *Journal of Science and Technology* 5:1-6.
- Anonymous. 1985. The Wealth of India, Publications and Information Directorate, CSIR, New Delhi. Volume I, 85-91.
- Anxiolytic and anticonvulsant activity of alcoholic extract of heart wood of *Cedrus deodara* Roxb. in rodents. *Journal of Pharmaceutical Research and Health Care* 1; 2:217-239,2009.
- Chatterjee A, Prakarashi SC. 1991. Treatise of Indian Medicinal Plants. *Coun. Sci. Industr. Res.* New Delhi.
- Chaudhri RD. 1996. Herbal Drugs Industry, the Eastern Publishers, 1st Edition; 1-3.
- Chopra RN, Nayar SL and Chopra IC. 1956. Glossary of Indian Medicinal Plants, CSIR, New Delhi, 10.
- Dhayabaran D, Jeyaseeli FE, Nanda K, 2010. Puratchikody A. Anxiolytic and anticonvulsant activity of alcoholic extract of heart wood of *Cedrus deodara* Roxb. in rodents. *Journal of Medicinal Plants Research* 4; 14:1374-1381.
- Goldlust MB, Harrity TW, Palmer I, Numonde DC, Jasani MK. 1978. The recognition of anti-rheumatic drugs. Lancaster: MTP Press. 119.
- Gulati BC. 1977. Oil of *Cedrus deodara*, cultivation and utilization of aromatic plants. Regional Research Laboratory, Jammu-Tawi, India; 640.
- Gupta RK, Kesari AN, Murthy PS, Chandra R, Tandon V, Watal G. 2005. Hypoglycemic and hypoglycemic effect of ethanolic extract of leaves of *Annonasquamosa* L. in experimental animals. *J. Ethnopharmacol* 99:75-81.
- Gupta S, Walia A and Malan A. 2011. Phytochemistry and pharmacology of *cedrus deodara*: AN OVERVIEW. Department of Pharmacology, M. M. College of Pharmacy, M. M. University, Mullana, Ambala, Haryana, India. *International Journal of Pharmaceutical sciences and research* Vol. 2(8): 2010-2020.
- Halliwell B, Gutteridge JMC. 1989. Free Radicals in Biology and Medicine. Clarendon Press. Oxford. 96-98.
- Jain SK. 1991. Dictionary of Indian folk medicine and ethnobotany. *Deep publication, India*. 68.
- Jogne B, Linda AA, David PJ. 1996. Herbal medicines - A guide for Health care professionals, *Pharmaceutical Press*, 2.

- Kar K, Puri VN, Patnaik GK, Rabindra N, Sur Dhawan BN, Kulshrestha DK, Rastogi RP. 1975. Spasmolytic constituents of Cedrus deodara (Roxb.) Loud: Pharmacological evaluation of himachalol. *Journal of Pharmaceutical Sciences* 64: 258-262.
- Krishnappa S, Dev S. 1978. Studies in sesquiterpenes LVIII: Deodardione, a sesquiterpene diosphenol and, limonenecarboxylic acid, a possible norsesquiterpene compounds from the wood of Cedrus deodara Loud. *Tetrahedron* 34:599-602.
- Kunin WE, Lawton JH. 1996. Does biodiversity matter? Evaluating the case for conserving species. In: Gaston KJ. Biodiversity, Blackwell Science LTD, UK,283-308.
- Makhaik M, Naik SN, Tewary DK. 2005. Evaluation of Antimosquito properties of essential oil. *Journal of Scientific & Industrial Research*. 64: 129-133.
- Makhaik M, Naik SN, Tewary DK. Evaluation of anti-mosquito properties of essential oils. *Journal of Scientific and Industrial Research*, 64:129-133,2005.
- Mukherjee PK, Verpoorate R. 2003. GMP for Botanicals and Quality issues on phytomedicines, Business Horizons.1: 152.
- Mukherjee PK. 2003. Exploring botanicals in Indian systems of medicine- regulatory perspectives. *Clinical Research and Regulatory Affairs*. 20:249-264.
- Newbould BB. 1963. Chemotherapy of arthritis induced in rats by mycobacterial adjuvants. *British Journal of Pharmacology and Chemotherapy* 21:127-136,1963.
- Patwardhan B, Hoper ML. 1992. Ayurveda and future drug development. *Int J Alt compl med*. 4:9-11.
- Pieroni A, Quare CL, Villanelli ML, Mangino P, Sabbatini G, Santini L, Boccetti T, Profili M, Ciccioioli T, Rampa LG, Antonini G, Girolamini C, Cecchi M, Tomasi M. 2004. Ethnopharmacognosticsurvey on the natural ingredients used in folk cosmetics, cosmeceuticals and remedies for healing sting diseases in the inland Marches, Central-Eastern Italy. *J Ethnopharmacol*.9:331- 344.
- Rajasekaran S, Sivagnanam K, Ravi K, Subramanian S. 2004. Hypoglycemic effect of Aloe vera gel on streptozotocin-induced diabetes in experimental rats. *Journal of Medicinal Food* 7:61-66.
- Ray A, Mediratta PK, Puri S, Sen P. 1991. Effect of stress on immune reponsiveness, gastric ulcerogenesis and plasma corticosterone in rats: modulation by diazepam and naltrexone. *Indian Journal Experimental Biology* 29:233.
- Ray A, Mediratta PK, Puri S, Sen P. 1991. Effect of stress on immune reponsiveness, gastric ulcerogenesis and plasma corticosterone in rats:modulation by diazepam and naltrexone. *Indian Journal Experimental Biology* 29:233.
- Rodnan GP, Schumacher HR. 1989.Role of immunologic mechanisms in the pathogenesis of rheumatic diseases. *The Arthritis Foundation*, Atlanta, GA.38.
- Saraf MN, Ghooi RB, Patwardhan BK. 1989. Studies on the mechanism of action of Semecarpusanacardium in rheumatoid arthritis. *J. Ethnopharmacol* 25:159-164.
- Shankaranarayan R, Krishnappa S, Bisarya SC, Dev S. 1977. Studies in sesquiterpenes-LIII: Deodarone and atlantolone, new sesquiterpenoids from the wood of Cedrus deodara Loud.*Tetrahedron* 33:1201-1205
- Sharma A, Parashar B, Vatsal E, Chandel S and Sharma S. 2016. Phytochemical Screening and anthelmintic activity of leaves of cedrus deodara (roxb.) Department of Pharmacy, ManavBharti University, Solan, Himachal Pradesh. Guru Nanak Dev University, Amritsar, Punjab. *World Journal Of Pharmacy And Pharmaceutical Sciences* 5 (8): 1618-1628.
- Sharma DK, Saxena VK, Sanil NK, Singh N. 1997. Evaluation of oil of Cedrus deodura and benzyl benzoate insarcoptic mange in sheep. *Small Ruminant Research* 26:81-85,
- Shinde UA, Phadke AS, Nair AM, Mungantiwar AA, Dikshit VJ. and Saraf MN. 1991. Studies on the anti-inflammatory and analgesic activity of Cedrus deodara (Roxb.) Loud. Wood oil. *Journal of Ethnopharmacology* 65:21-27,1991.
- Shivanand, P, Viral D, Goyani M, Vaghani S, Jaganathan K. 2009. Formulation and evaluation of Cedrus deodara Loud. Extract. *International Journal of ChemTech Research* 1; 4:1145-1152.
- Singh AP. 2005. Promising Phytochemicals from Indian Medicinal Plants. *Ethnobotanical Leaflets*.9: 15-23.
- Singh D, Agrawal SK. 1988.Himachalol and  $\beta$ -himachalene: Insecticidal principles of himalayan cedar wood oil. *J Chem Ecology* 14:1145-1151.
- Thomas WR, Vardinon N, Walkins MC, Ashershon GL. 1980. Antigen-specific mast cell degranulation in contact sensitivity to picryl chloride, An early event. *Immunology* 29:331.
- Tiwari AK, Srinivas PV, Kumar SP, Rao JM. 2001. Free Radical Scavenging Active Components from Cedrus deodara. *Journal of Agricultural and Food Chemistry* 49; 10:4642-4645.
- Tiwari DM. 1994. Distribution and Morphology: A monograph on Deodar. International book Distributors, Dehradun 14.
- Upadhyya S, Shanbhag KK, Suneetha G, Balachandra Naidu. 2004. A study of hypoglycemic and antioxidant activity of Aeglemarmelos in alloxan induced diabetic rats. *Indian J. Physiol. Pharmacol* 48:476-480.
- Viswanatha GL, Kumar KN, Shylaja H, Ramesh C, Rajesh S, Srinath R. 2009.
- West GB. 1982. Effects of levamisole and D-penicillamine on contact sensitivity to oxazolone inrats. *Int Archs Aller Appl Immunol* 67:184-186.
- Wilkinson PC, Vane JK, Ferreria SH. 1962. Handbook of experimental pharmacology. Berlin: Springer-Verlag.109.
- Winter CA, Risley EA, Nuss GW. Carrageenan-induced edemas in hind paw of the rat as an assay for anti-inflammatory drugs. *Proceedings forthe Society Experimental Biology and Medicine* 11:544-547,1962.
- Yan-qiu C, Xin-hong C, Yi Z, Qun Z, Peng N. 2008. Chemical Composition and Antimicrobial Activity of Volatile Oil of Six Gymnosperm Species Leaves from Shanghai. *Bioinformatics and Biomedical Engineering* 4573- 4577.
- Zhang JM, Shi XF, Li C, Fan B, Wang DD, Liu DY. 2010. Study on the chemical constituents from pine needles of Cedrus deodara. *Zhong Yao Cai* 33;2:215-8.
- Zhang JM, Shi XF, Ma QH, He FJ, Wang DD, Liu DY, Fan B. 2010. Studies on the chemical constituents from pine needles of Cedrus deodara (II). *Zhong Yao Cai*, 33;7: 1084-6.

\*\*\*\*\*