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Preliminary phytochemical, pharmacognostical and physico-chemical evaluation of *Cedrus deodara* heartwood

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ABSTRACT
Deodar (*Cedrus deodara* Roxb.) is one of the most useful traditional medicinal plant in India. Each part of the Deodar tree has some medicinal property and is thus commercially exploitable. During the last five decades, apart from the chemistry of the Deodar compounds, considerable progress has been achieved regarding the biological activity and medicinal applications of Deodar. The present study was carried out to investigate morphological, microscopical, physicochemical and phytochemical screening of *Cedrus deodara* heartwood. Morphological studies showed the presence of various diagnostic characters. In the microscopical studies showed the presence of Collenchyma, Xylem parenchyma, Tracheids and Sclrenchyma. Ash value, extractive value and moisture content were determined for quality standard of drugs. Phytochemical investigation shows the presence of tannins, flavanoids, alkaloids, and terpenoids.

Keywords: *Cedrus deodara*, Heartwood, Phytochemical, Physicochemical.

1. Introduction
Cedrus deodara Roxb (family: Pinaceae) is a genus of majestic evergreen tree distributed in the Mediterranean region and the western Himalayas. All species are mountain inhabiting and their respective ranges are widely separated. One species, *Cedrus deodara* the Himalayan cedar or Deodar, is an important Indian timber tree [1]. As Himalaya is considered to be the home of gods, it is believed that the forests are the part of their house. The landscape around temple is considered sacred and is preserved as temple grove. The tree of *Cedrus deodara* is believed to be the tree of God and is planted around temples," the word deodar comes from devadaru, a Sanskrit word that translates to "divine wood" or "timber of God." The deodars is revered in the Himalayas and frequently mentioned in Hindu stories. Kashmiri and Punjabi villagers worshipped the "devadaru" tree god [2, 3]. The wood of *C. deodara* has been used since ancient days in Ayurvedic medical practice for the treatment of inflammations and rheumatoid arthritis [4, 5]. During a routine screening of Indian medicinal plants for biological activity, 50% ethanolic extract of the wood of *C. deodara* showed a significant anti-spasmodic activity [6]. The alcoholic extract of the stem of *C. deodara* was found to have anti-cancer activity against human epidermoid carcinoma of nasopharynx in tissue culture [7]. The oil of *C. deodara* wood was found to have potent disinfectant [8] and anti-fungal properties [9].

1.1 Scientific classification [1]

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

2. Material and Methods
2.1 Collection and identification of plant part (Heartwood)
The heartwood of *Cedrus deodara* was collected from local market Indore and was identified from Govt. Agricultural College, Indore, India. A voucher specimen no. Scope/Ph.cog/07- 09/02 is retained in pharmacognosy departmental museum for further reference.

2.2 Pharmacognostic study

2.2.1 Macroscopic study

The macroscopic characters such as color, odor, taste, shape and size were evaluated according to Ayurvedic pharmacopoeia [10, 11].

2.2.2 Microscopic study/ Powder Microscopy

The coarse powder was boiled with chloral hydrate to remove the coloring matter then few amount of decolorized powder is placed on a glass slide using glycerin. Then powder was strained with phloroglucinol then it is covered with a cover slip and it was viewed under microscope [10, 11].

2.3 Physiochemical study

2.3.1 Ash value

2.3.1.1 Determination of total ash: Weigh accurately 3.00 gm of the air dried powder drug in tarred silica dish and incinerate at a temperature not exceeding 450 ^{0}C until free from carbon, cool and weigh calculate the percentage of ash with reference to air dried drug [12].

2.3.1.2 Determination of water soluble ash: Boil the ash for 5 minutes with 25 ml of water, collect the insoluble matter in a Gooch crucible or on ash less filter paper wash with hot water and ignite for 15 minutes at a temperature 450 ^{0}C subtracts the weight of the insoluble matter from the weight of the ash, the difference in the weight represents the water soluble ash. Calculate the percentage of water soluble ash with reference to the air dried drug [12].

2.3.1.3 Determination of Acid insoluble ash

Procedure: Boil the ash for 5 minutes with 25 ml of 2M HCl, collect the insoluble matter in a Gooch crucible or on ash less filter paper wash with hot water and ignite for 15 minutes at a temperature 450 ^{0}C then cool in a desiccator and weight. Calculate the percentage of water soluble ash with reference to the air dried drug [12].

2.3.2 Extractive Value

2.3.2.1 Determination of Alcohol soluble extractive value: Macerate 5 gram of the air dried powder drug, with 100 ml of ethanol of the specified strength in a closed flask for 24 hours, shaking frequently during the first six hours and allowing standing for 18 hours. Therefore, filter rapidly taking precautions against loss of ethanol, evaporate 25 ml of the filtrate, to dryness in a tarred flat bottomed shallow dish, dry at 105 ^{0}C and weigh. Calculate the percentage of ethanol soluble extractive with reference to the air dried drug [12].

2.3.2.2 Determination of Water soluble extractive value: Weigh accurately the 5 gm of air dried powder drug and macerate it with 100 ml of chloroform water in a closed flask for 24 hours, shaking frequently during the first 6 hours and allowing standing for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of the solvent. Then 25 ml of the filtrate was evaporated to dryness in a tarred flat bottomed, shallow dish, dried at 105 °C and weighed. The percentage of water soluble extractive was calculated with reference to the air dried drug [12].

2.3.3 Loss on drying: **Loss on drying** was determined by the IR moisture balance.

2.4 Qualitative Phytochemical screening of plant extract [10]

2.4.1 Test for Alkaloids

Dragendorff's Test: To 1 ml of the extract, add 1 ml of Dragendorff's reagent (Potassium Bismuth iodide solution). An orange-red precipitate indicates the presence of alkaloids.

Mayer's Test: To 1 ml of the extract, add 1 ml of Mayer's reagent (Potassium mercuric iodide solution). Whitish yellow or cream colored precipitate indicates the presence of alkaloids.

Hager's Test: To 1 ml of the extract, add 3 ml of Hager's reagent (Saturated aqueous solution of picric acid), yellow colored precipitate indicates the presence of alkaloids.

Wagner's Test: To 1 ml of the extract, add 2 ml of Wagner's reagent (Iodine in Potassium Iodide), Formation of a reddish brown precipitate indicates the presence of alkaloids.

2.4.2 Test for Saponins: Take small quantity of Alc. and Aq. extract separately and add 20 ml of distilled water and shake in a graduated cylinder for 15 minutes lengthwise. A 1 cm layer of foam indicates the presence of Saponins.

2.4.3 Test for Glycosides

Legal Test: Dissolve the extract in pyridine and add sodium nitroprusside solution to make it alkaline. The formation of pink red to red color shows the presence of glycosides.

Baljet Test: To 1 ml of the test extract, add 1 ml of sodium picrate solution and the yellow to orange color reveals the presence of glycosides.

Keller-Kiliani Test: 1 gm of powdered drug is extracted with 10 ml of 70% alcohol for 2 minutes, filtered, adds to the filtrate 10 ml of water and 0.5 ml of strong solution of lead acetate and filtered and the filtrate is shaken with 5 ml of chloroform. The chloroform layer is separated in a porcelain dish and removes the solvent by gentle evaporation. Dissolve the cooled residue in 3 ml of glacial acetic acid containing 2 drops of 5% ferric chloride solution. Carefully transfer this solution to the surface of 2 ml of concentrated sulphuric acid. A reddish brown layer forms at the junction of the two liquids and the upper layer slowly becomes bluish green, darkening with standing.

Borntrager's Test: Add a few ml of dilute Sulphuric acid to 1 ml of the extract solution. Boil, filter and extract the filtrate with chloroform. The chloroform layer was treated with 1 ml of ammonia. The formation of the red color of the ammoniacal layer shows the presence of anthraquinone glycosides.

2.4.4 Test for Phenolic Compounds and Tannins

(a) Take the little quantity of test solution and mixed with basic lead acetate solution. Formation of white precipitates indicates the presence of tannins.

(b) To 1 ml of the extract, add ferric chloride solution, formation of a dark blue or greenish black colour product shows the presence of tannins.

2.4.5 Test for Flavonoids

Shinoda's Test: The alcoholic and aqueous extract of powder treated with magnesium foil and concentrated HCl give intense cherry red color indicates the presence of flavones or orange red colour indicates the presence of flavonols.

(a) The extract is treated with sodium hydroxide; formation of yellow colour indicates the presence of flavones.
(b) The extract is treated with concentrated H_2SO_4, formation of yellow or orange colour indicates flavone.
(c) The Alc. and Aq. extract is treated with 10% sodium chloride; formation of yellow colour indicates the presence of coumarins.

2.4.6 Test for Triterpenoids
Noller's Test: Dissolve two or three granules or tin metal in 2 ml thionyl chloride solution. Then add 1 ml of the extract into test tube and warm, the formation of pink colour indicates the presence of triterpenoids.

2.4.7 Test for Fixed Oils and Fats
Spot Test: Press a small quantity of extracts between the filter paper. Oil stains on the paper indicates the presence of fixed oils [10].

3. Result and Discussion

3.1 Pharmacognostic study: Pharmacognostic studies include macroscopic and microscopic characteristics which provide a suitable standard for identification and authentication of crude drug.

3.1.1 Macroscopy: The macroscopic character was useful in quick identification of plant material and also serves as an important standardization parameter. Macroscopical studies showed that the heartwood is yellowish brown in color, aromatic in odour and bitter in taste.

3.1.2 Microscopy: Powder microscopy showed the presence of Collenchyma, Xylem parenchyma, Tracheids and Sclrenchyma.

Fig 1: Heartwood of *Cedrus deodara* (Roxb.)

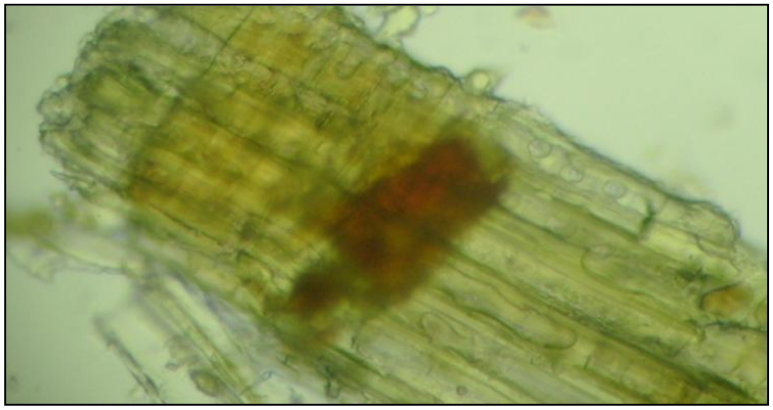

Fig 2a: Microscopy of the heartwood of *Cedrus deodara* that show presence of Collenchyma **Xylem parenchyma**

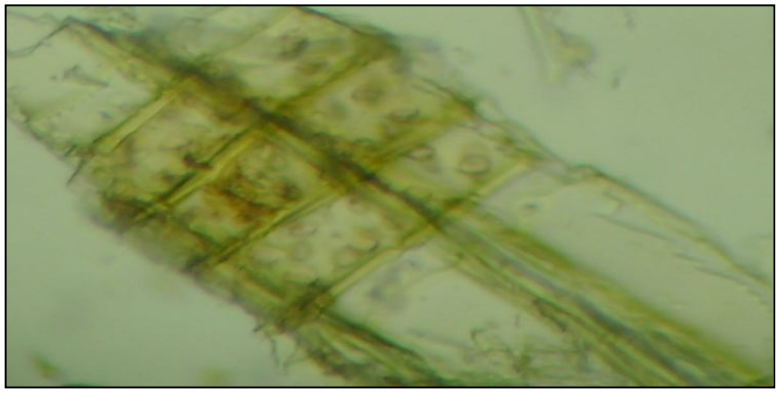

Fig 2b: Microscopy of the heartwood of *Cedrus deodara* that show presence of **Xylem parenchyma**

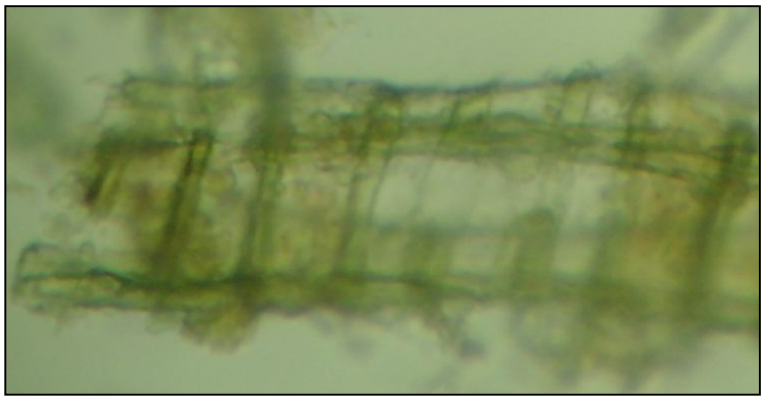

Fig 2c: Microscopy of the heartwood of *Cedrus deodara* that show presence of **Tracheids**

Fig 2: Powder microscopy of heartwood of C*edrus deodara*.

3.3 Physiochemical studies: Various physicochemical parameters viz., ash, extractive values and loss on drying were determined. The results were summarized in Table 1. These data's were helpful for identifying and ascertaining the quality of the collected crude drug.

Table 1: Ash value of heartwood powder of *Cedrus deodara*

S. No.	Physicochemical Parameters	% w/w
1.	Total ash	1.51 ± 0.10
2.	Acid insoluble ash	0.43 ± 0.04
3.	Water soluble ash	0.83 ± 0.05
4.	Alcohol soluble extractive value	4.95 ± 0.23
5.	Water soluble extractive value	3.57 ± 0.18
6.	Loss on drying	1.09 ± 0.06

Values ± S.E.M, n = 3

3.4 The Qualitative phytochemical screening: Preliminary phytochemical screening indicated that the Aq. and Alc. extracts of the powdered *Cedrus deodara* Roxb. containing tannins, flavonoids, alkaloids, and terpenoids.

Table 2: Result of Qualitative phytochemical screening Test

S. No.	Experiment	Aq. Extract	Alc. Extract
1.	Alkaloids	+	-
2.	Glycosides	+	+
3.	Tannins	+	+
4.	Saponins	+	+
5.	Flavonoids	+	+
6.	Terpenoids	-	+

+ Sign indicates presence whereas – indicates absence of constituents

4. Conclusion

In the present context, traditional/herbal remedies are having a vital role in health care systems, because these drugs are easily available at low cost, safe and people have faith in them. As the usage of these herbal medicines has increased, issues regarding their quality, safety, and efficacy have raised up. The purpose of standardization of medicinal plants is obviously to ensure therapeutic efficacy. Morphological and anatomical studies of plant parts will enable to identify the crude drug. The information obtained from the preliminary phytochemical screening will be useful in finding out the genuineness of the drug. Ash values, extractive values and moisture contents can be used as a reliable aid for detecting adulteration. In the present investigation various standardization parameters such as macroscopical, microscopical, physicochemical parameters and phytochemical screening of *Cedrus deodara* Linn was carried out. Thus, our study is an important landmark in correct identification of *Cedrus deodara*

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