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Abies Webbiana in Focus: A Review of its Medicinal Significance and Phytochemical Composition

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ABSTRACT :

Since the Vedic era, a variety of medicinal herbs have been employed. They have been used for thousands of years to both cure and prevent a wide range of illnesses and conditions. Abies webbiana Lindl, sometimes referred to as the Talisapatra and used to cure a variety of illnesses and conditions, is a well-known plant. Talisapatra has been used therapeutically since the Veda and several Ayurvedic writings. This is an overview of the literature that ranges from modern reviews of Ayurvedic scriptures. Ayurvedic Pharmacopeia of India, databases on Indian medicinal plants, and recent research findings from Google Scholar, PubMed, Scopus, Ayurvedic publications, and research works are all resources that scientists, researchers, and scholars may find helpful in easily documenting their future work. The Pinaceae family of plants, Abies webbiana (Wall ex D. Don) Lindl, is planted in Northern India, Afghanistan, China (Tibet), Nepal, and Pakistan in order to assess the plant's potential for medicinal use. This tree reaches a height of 50 meters. The leaves of this species have use in the Ayurvedic and Siddha medical systems. It has stomachic, tonic, carminative, and expectorant properties. It is the primary component in Siddha formulations used to treat respiratory issues like colds, coughs, wheezing, TB, indigestion, lack of appetite, and vatha illnesses, such as Thalisathi choornam and Thalisadi vadagam. Steroids, terpenes, sugars, phenols, flavonoids, tannins, saponins, and quinones were detected by phytochemical screening. The leaf material had the following characteristics: pH was 5.25, water-soluble extractive (23.79%), alcohol-soluble extractive (18.37%), total ash (5.23%), acid-insoluble ash (0.57%), and loss on drying (6.90%). Benzenepropanol, 4-hydroxy-à-methyl, 2-furancarboxaldehyde, and 5-(hydroxymethyl) are the main constituents of the 29 compounds that were found using GC-MS analysis.

Keywords: Abies webbiana, Pharmacognosy, Phytochemicals, Gas chromatography-mass spectrometry, Herbal medicine

INTRODUCTION :

The tall, evergreen Talisapatra tree grows to a height of 60 meters by 10 meters and has strong, horizontally spreading branches. It is found in the Himalayas. Talisapatra is a member of the Pinaceae Family and may be found in the Himalayan forests at elevations between 3000 and 4500 meters. Its botanical name is Abies webbiana Lindl. Syn. A. spectabilis (D.Don) Spach.[1] Talispatra substitutes found in Indian local markets include Flacourtia catacarphracta Roxb., Taxus baccata Linn., Rhododendron lepidotum D. Don., Rhododendron anthopogon D. Don., Abies pindrow Royale., Pinus wellichiana, and Cinnamomum tamala. The leaves of this plant are highly sought after in Indian medicine. Nees and Ebrem.[1]. It was formulated in several medications from Vedic literature to Ayurveda samhitas. Its morphological properties were described in various Lexicons or nighantus of Dravyaguna Vijnana, along with Rasa Guna Virya, Vipak, and Karma, among others. Here, fresh study on talisapatra as it relates to various illnesses including svasa, kasa, mukharoga, kshaya, chardi, aruchi, agnimandya, gulma, rakta pitta, hikka, etc., will be documented using standardized methodologies and phytochemical evaluations. Talisapatra's pharmacological activities include antibacterial, mast cell stabilizing, anxiolytic, anti-tumor, anti-inflammatory, antitussive, and actions that depress the central nervous system (CNS), as well as anti-spasmodic, bronchodilator, antiplatelet, hepatoprotective, and kidney-protective properties.

The majority of traditional medical systems rely on plants and their varied elements. Lower plant groupings including bryophytes, fungi, and pteridophytes were shown to have minimal or nearly no contribution to the TMS (Traditional Medicinal System) when compared to angiosperms. On the other hand, Actinopteris radiata (Sw.) Link, Drynaria quercifolia (L.) Sm., and Selaginella bryopteris (L.) Baker are among the Pteridophytes members whose therapeutic qualities have been documented. As a result, in the distinct TMS, several gymnosperms are utilized as medicines in addition to angiosperms inside the spermatophytes. The groupings of naked-seeded plants that have survived since the Mesozoic epoch (300–350 MYA) are called gymnosperms. Due to their stunning appearance and numerous uses in the wood industry (e.g., Agathis australis (D.Don) Lindl., Cedrus deodara (Roxb. ex D.Don) G.Don), horticulture and landscape (e.g., Conifers, Cycad), essential oils (Cedrus deodara (Roxb. ex D.Don) G.Don, Juniperus virginiana L.), food (e.g., Cycas, Pinus, Araucaria, Ginkgo, etc.) as well as a Radha et al. J Res Sid Med 2018; 1(1): 23–32. 24 medications,

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such as Abies Ephedra, Taxus, Cedrus, and Cycas [2]. There are around 75 species and 14 genera of gymnosperms in India.In Indian traditional medicine, Pinus and Ephedra are referenced in the Ayurvedic and Unani literatures with Cycas, Cedrus, Abies, and Taxus, according to the Siddha literatures. The Indian Gymnosperms, such as Araucaria, Abies, Juniperus, Cupressus, Pinus, and others, are mostly found in the Himalayas. The ethno-medicinal properties, pharmacological properties, and phytochemical analyses of Indian Gymnosperms have been documented via several investigations conducted in various locations. Abies pindrow Royle's bark may be used to cure rheumatism, cough, and bronchitis; resin can speed up the healing of cuts and wounds; and leaf powder can be taken with Adhatoda vasica juice.

Juniperus communis L. wood oil and berries are used to treat a variety of conditions, including warts, polyps, leucorrhoea, and gonorrhea. Cupressus sempervirens L. wood and fruits are used as an astringent and anthelmintic. The oil that is derived from the stem and bark of Cedrus deodara (Roxb. ex. D. Don) G. Don is applied externally to cure ulcers and skin rashes. Cuts and wounds are treated with young saplings of Pinus wallichiana Jackson (Resin). Asthma is treated with two daily doses of powdered Abies webbiana Lindl. leaves. [3] Asthma, bronchitis, and arthritis are treated using gnetum species as traditional remedies. The leaves of Gnetum africanum Welw. (Gnetaceae) are chewed or boiled into a soup to treat hypertension, diarrhea, and sore throat. Southern Thailand also uses Gnetum gnemon L. leaves and young inflorescences, which are cooked and flavored with coconut cream. There have been reports of Gnetum gnemon's antibacterial, antioxidant, antimicrobial, and anti-aging properties. Studies on phytochemicals and pharmacology have demonstrated the therapeutic benefits of three distinct pine species, including Pinus roxburghii Sarg., Pinus wallichiana A.B. Jacks, and Pinus gerardiana Wall. ex D. Don. Pinus wallichiana Young saplings of A. B. Jackson (Resin) are used to cure cuts and wounds. Pinus nigra J.F. Arnold, Pinus brutia Ten., and Pinus sylvestris L. were mostly utilized to cure respiratory disorders, urinary problems, skin conditions, and asthma, among other human ailments.Jaundice is treated by species of Podocarpus falcatus (Thunb.) Endl. Berries are used to treat respiratory disorders, while a decoction of ephedra stem and root is used to treat rheumatism, asthma, and syphilis. Three Indian gymnosperms utilized in Siddha formulations—Talisapatri, Devatharam (Devadaru), and Madhanakamapoo—were the subject of this review, which sought to describe their medicinal and ethnobotanical purposes. Three significant Indian gymnosperms—Talisapatri, Devadaru, and Madhanakamapoo—are utilized in Siddha treatment.

Pinus wallichiana Young saplings of A. B. Jackson (Resin) are used to cure cuts and wounds. Pinus nigra J.F. Arnold, Pinus brutia Ten., and Pinus sylvestris L. were mostly utilized to cure respiratory disorders, urinary problems, skin conditions, and asthma, among other human ailments.Jaundice is treated by species of Podocarpus falcatus (Thunb.) Endl. Berries are used to treat respiratory disorders, while a decoction of ephedra stem and root is used to treat rheumatism, asthma, and syphilis. Three Indian gymnosperms utilized in Siddha formulations—Talisapatri, Devatharam (Devadaru), and Madhanakamapoo—were the subject of this review, which sought to describe their medicinal and ethnobotanical purposes. Three significant Indian gymnosperms—Talisapatri, Devadaru, and Madhanakamapoo—are utilized in Siddha treatment. Scientific search engines like PubMed, Scopus, Google Scholar, and others were used to gather literature about the ethnomedical uses of various sources, including Siddha literature. The botanical name, Siddha name, family, portion utilized, main chemical components, and Siddha formulations in which the plants have been employed were included along with other pertinent information about the plants [4]. A lengthy discussion was held on adulterants, substitutes, and conservation of the plants under study. The worldwide standard website was used to verify the species' recognized name and nomenclature. It serves as a stomachic, carminative, expectorant, and tonic in the Siddha medical system. This plant powder is administered topically to treat sinusitis, headaches, and heaviness in the head after being mixed up with vinegar. The leaf powder decoction may be gargled for mouth ulcer and throat discomfort, and it can also be used as a tooth powder for tooth ache [5]. It is used to treat bone fever, gastritis, vomiting, indigestion, fever, wheezing, and persistent cough [4]. It is the primary component of several Siddha formulations, including Elathi curnam, Thuthuvalai nei, Thalisathi choornam, and Thalisadi vadagam.

Webbiana leaves are said to possess antimicrobial, antifungal, antitumor, anti-inflammatory, antitussive, anti-fertility, febrifuge, antispasmodic, and central nervous system depressant qualities. They are also said to be effective against rheumatism, hyperglycemia, and conception [6]. The bronchodilator and antiplatelet properties of A. webbiana were examined, and the extract's antioxidant and antibacterial properties were assessed. An analysis was conducted on the impact of A. webbiana leaf extract on inflammation and sleeping time. Planar chromatography was used by Ghosh and Bhattacharya to visualize the chemical variety in A. webbiana leaves using several solvent extracts. They were able to discover triterpenoids, steroids, amino acids, flavonoids, saponins, tannins, alkaloids, and lipids. Certain chemical constituents were identified through phytochemical screening, including diterpene glycosides, phytosterols, and monoterpenes (found in essential oil). Additionally, a new biflavonoid called Abiesin and a nitrogenous compound called 1-(4'-methoxyphenyl)-aziridine were isolated [7]. Despite the small number of studies on A. webbiana leaves, little is known about their botanical or chemical characterisation, including gas chromatography-mass spectrometry (GC-MS) study, as of yet. Given that A. webbiana leaves are often employed in Indian traditional medicine, we looked into the pharmacognostic characteristics of the leaves in this study in order to identify and validate the raw material for usage as an ingredient in a number of formulations.

MATERIALS & METHODS :

Making the medication ready The raw substance was purchased from the local Thanjavur, Tamil Nadu, India market. It was recognized at the CARISM lab at SASTRA University, which is accredited by NABL, and it was verified by macroscopic and microscopic analysis. A. webbiana leaf was ground into a 1 mm powder in a lab mill and utilized for further analysis.

By combining one pinch of powdered medication with one or two drops of Sudan red solution, gently heating the mixture, and irrigating it with ethanol (750 g/L), the presence of fats and fatty oils was determined. The slides were then mounted and examined under a microscope. To study mucilage, a

pinch of powdered medication was applied to slides, which were then mounted and examined under a microscope after being treated with Chinese ink (1:10 with water). A pinch of powdered medication was treated with an iodine (0.02 M) solution for the starch test, after which the slides were mounted and examined under a microscope. investigations using microscopic Using a razor blade, a transverse piece of A. webbiana was obtained, and very thin parts were selected. Several stain solutions, including toluidine blue "O," 1% phloroglucinol, Sudan red, and iodine potassium iodide, were used to stain the thin slice [6]. A. webbiana leaf powder's powder microscopic characteristics were also investigated [7]. A pinch of powdered medication was treated with 60 g/L of acetic acid to reveal the existence of calcium carbonate crystals. The preparation was then mounted and examined under a microscope.

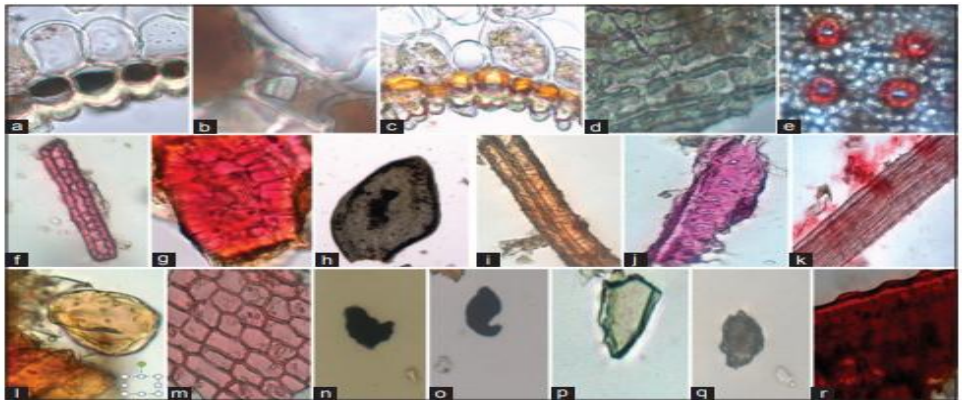
Standardization of chemicals Using a pH meter set at 24.4°C, the pH of the aqueous solution containing 1% W/V of A. webbiana powder was determined. The amount of total ash in the powdered A. webbiana leaf was ascertained [8]. A pre-weighed silica crucible is filled with powder (1.0896 g), and it is heated in a muffle furnace for approximately three hours at 400°C. Following a safe placement of the crucible in the desiccator and a cooling period to room temperature, the weight was finally recorded. The formula (Weight of the ash/Weight of the drug×100) is used to get the percentage weight of the ash. The formula to determine the proportion of acid-insoluble ash is Weight of the residue/Weight of the powder×100, where the weight of the residue equals the net weight of ash. A pre-weighed dish containing 1.0605 g of powder was put on a hot plate at 105°C to estimate the loss on drying (LOD). The LOD was then determined using the formula (Weight of the dish before LOD−Weight of the dish after LOD/Weight of the sample×100). The powder's extractives that were soluble in alcohol and water were examined. Two beakers containing 1.0034 g of dry powder were filled with 50 ml of alcohol in the first and 50 ml of water in the second, and they were shaken vigorously by hand. After the beakers were set aside for a full day, 10 milliliters of the solution were removed and heated to 105 degrees Celsius in a hot air oven. Lastly, the formula (Weight of residue/Weight of the drug×100) is used to get the percentage weight of the extract (Table 1). Preparing an extract In individual conical flasks, 10 g of dry powdered material was combined with 100 ml of hexane, chloroform, ethyl acetate, ethanol, methanol, and water to prepare the extract.

The mixer was left at room temperature (37°C) for a whole day. Following that, the contents were filtered through filter paper that was set on top of the funnel. The extract's volume was then recorded, and the resulting extracts were utilized for phytochemical screening. Screening for phytochemicals To detect the presence of phenolic compounds, mix 1 milliliter of extract with 5 milliliters of alcohol and a little amount of ferric chloride. Using Dragendorff's test, which involved taking 0.5 milliliter of extract, 0.2 milliliter of acetic acid, and 1 milliliter of Dragendorff's reagent and shaking it thoroughly, alkaloids were shown to be present. By mixing 2 milliliters of extract with 1 milliliter of hydrochloric acid, a pinch of magnesium turnings, and boiling for a few minutes, the existence of flavonoids was found. By gently heating 0.5 milliliter of the extract with a tin pellet and 0.2 milliliter of thionyl chloride, the terpenoids were found. By mixing 2 milliliters of extract with 1 milliliter of hydrochloric acid, a pinch of magnesium turnings, and boiling for a few minutes, the existence of flavonoids was found. By gently heating 0.5 milliliter of the extract with a tin pellet and 0.2 milliliter of thionyl chloride, the terpenoids were found.

0.5 milliliters of extract and 0.1 milliliters of sulfuric acid were added to determine the presence of quinones. 0.5 ml of extract and 0.2 ml of sodium hydroxide were combined for the coumarins test. To identify the sugars, the extract (0.5 ml) was combined with Fehling's (A and B). GC-MS examination In conical flasks, 10 g of dry powdered material was combined with 100 ml of methanol to prepare the extract for GC-MS analysis. The mixer was left at room temperature (37°C) for a whole day. After that, the extract's volume was measured after being filtered through filter paper that had been put on the funnel. For three hours, the extracts were left in the water bath to dry. Following drying, a gas chromatographic apparatus with mass spectrometry (Perkin Elmer, Model: Clarus-500) was used to examine the methanol extract. A 30 m×0.25 mm silica capillary column with 0.25 µm film thicknesses and Elite-5 MS non-polar fusion technology was utilized. Helium was the carrier gas, flowing at a rate of one milliliter per minute, and the oven temperature was programmed to rise by 6°C per minute to 150°C. The injector temperature was set at 280°C. A split ratio of 1:10 was used for injecting the sample (1.4 µl). In the electron ionization mode, an ion source temperature of 160–200°C and a mass scan range of 40–450 amu were employed, with an ionization energy of 70 eV. By comparing the generated mass spectra with the built-in NIST library database, fragments of the different chemicals found in the extracts were found.

RESULTS & DISCUSSION :

Investigations using microscopic Upper and lower epidermis, a vascular bundle, and oil-containing cells were visible in the transverse slice leaf (Fig. 1a). The single layer of spherical, thick-walled cells with a thick cuticle makes up the upper epidermis. Two layers of elongated palisade parenchyma cells follow the upper epidermis, and then there are numerous big, brown-colored cells that contain oil next to them (Fig. 1b). Single-layered papillose cells with thick cuticles make up the lower epidermis (Fig. 1c). The leaf center has an open vascular bundle. The adaxial side of the leaf contains xylem, whereas the abaxial side has phloem. The three to four layers of lignified cells that make up xylem are called tracheids and fibers. Multiple layered compacted cells make up phloem (Fig. 1d). Enchyma cells with a round form were seen on both the left and right side of the vascular bundle. The vascular bundle is encircled by a collection of oil-containing tiny and big cells. In parenchyma cells, simple and complex starch granules with rounded, oval, and polygonal shapes were seen.



CONCLUSION :

The Heritiera fomes species responds differently to metal tolerance in different plant sections and at different ages when exposed to high concentrations of micronutrients or heavy metals during the early seedling stage. Compared to younger seedlings, older seedlings seemed to be more metal-tolerant. Thus, while assessing the dangers presented by heavy metals in an ecosystem, it is important to consider the impacts of metal pollution on early seedlings. Lastly, it may be proposed that Heritiera fomes are becoming physiologically less able to survive in habitats with rising salinity due to a combination of environmental pressures and anatomical inequality. The day is not too far off when one will need to use magnifying glasses in order to identify the Sundari tree, Heritiera fomes, which is found in the Indian portion of the Sundarban mangroves. Lastly, it may be proposed that Heritiera fomes are becoming physiologically less able to survive in habitats with rising salinity due to a combination of environmental pressures and anatomical inequality. The day is not too far off when one will need to use magnifying glasses in order to identify the Sundari tree, Heritiera fomes, which is found in the Indian portion of the Sundarban mangroves.

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