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Understanding The Pharmacognostical Approach of The Members of Combretaceae- A Comprehensive Review

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ABSTRACT

Combretaceae family are diverse class of plant species, which has plants with pharmacological and medicinal properties. Its phytochemical properties are also being discussed. The characteristic feature of few members of combretaceae family Terminalia arjuna, Combretum indicum are being extensively discussed.

KEYWORDS: *Combretum indicum, combretaceae family, Terminalia arjuna, pharmacological, medicinal properties.*

INTRODUCTION

Distinguishing characters of the plant species belonging to combretaceae family

- Flowers usually small.
- Leaves simple, entire and the petiolate.
- Ovary inferior.
- Hypanthium divided into two regions (a lower surrounding the ovary and an upper narrowed into the shorter or longer tube finished in the calyx lobes).
- Trichomes long, straight, sharply pointed, unicellular with the very thick walls and with a conical internal compartment at the base.
- Presence of stalked glands or the glandular scales.5

Economic importance of combreataceae

Many plant species in the family have economic value. For example, several species of Anogeissus and the Terminalia are valued as timber tree for African, European and American markets.

These encompass: T. superba, T. oblonga, T. amazonia, T. elliptica, T. cuneata, Anogeissus acuminate and the A. latifolia. Fruits of several species of Terminalia for example, Terminalia catappa, as well as species of the Combretum have edible kernels whereas Buchenavia species have edible succulent endocarps. Chemical bio-constituents like tannins are also found in fruits, bark, leaves, roots and timber in buchenavia and the terminalia genera. Many of the species are reputed to comprise antimicrobial constituents and Terminalia species occurring in the Southern Africa and Asia have exhibited substantial antifungal activity, hence they are availed in traditional medicine. 2 Distribution and habitats of combretaceae Combretaceae occur throughout the tropics, with the short extensions into warm temperate zones such as in Argentina, South Africa, Australia, the Bermuda, China and in India(Jyoti Sahu et al.,2013).

The two largest genera of the family, Combretum and the Terminalia, occur on all continents (Combretum was not recorded in Australia until 1980). The greatest biogenetic diversity of the largest genus, Combretum is in Africa, and that of the second largest genus, Terminalia, is in the Southeast Asia, however this does not translate to center of origin, further studies are required to confirm origin of the genera. The Mangrove species of Laguncularia and Conocarpus occur in coastal regions of America, Australia and also in Africa, while Lumintzera is distributed in Asia and Africa together with Anogeissus and Quisqualis. The Cultivation and collection:

Terminalia Arjuna

Arjuna is found as naturally growing plant in the dense forests. It is very common in Baitul, Madhya Pradesh, places like Dehradun and Uttarakhand. Arjuna can be successfully raised by sowing seeds or by means of stumps. The seeds take about 21 days for germination. It needs moist fertile alluvial loam rainfall in the range of 75-190 cm. It grows satisfactorily up to 450 C. The bark is collected from the wild growing plants (Carpio,1997).

OVERVIEW

Many Combretum spp. have recorded uses in ethnomedicinal and ethnopharmacological systems, particularly in the southern African and Indian medicinal systems where they have been recorded as being availed to treat pathogenic infections, diarrhoea, malaria, inflammation, cancer, diabetes, bleeding and digestive disorders. The biology and the

phytochemistry of the southern African species have been well studied and assessed due to their usage in the South African ethnomedicinal systems given their high antioxidant capacities. The identification of interesting bio-compounds (particularly the promising anticancer compound combretstatin A-4) has generated the substantial recent interest in southern African Combretum spp. Of those native to southern Africa, the Combretum caffrum (Eckl. & Zeyh.) Kuntze, the Combretum erythrophyllum (Burch.)(Fig-1) Sond. and Combretum molle R.Br. ex G.Don are particularly well documented due to their varied avails in South African traditional medicine by a wide variety of groups encompassing the Zulu, Xhosa, Sotho and thother communities. As with many other Combretaceae, the species in the genus Combretum are precisely characterised by their high antioxidant capacities and their high levels of the tannins (Tadros et al.,2004).

Figure: 1

Therefore, the high antioxidant capacities inherent in the Combretum spp. may have both preventative and curative activities against many diseases by reducing the oxidative cellular damage. Similarly, the complexity and abundance of the tannin components in the Combretum spp. preparations would also mainly contribute to their anti-pathogenic (Yashraj Yadav et al.,2011). In addition to the tannins, the precise stilbene contents of the Combretum spp. have generated much interest due to the biptherapeutic properties of the stilbenes. Combretstatin A-4 has especially been regarded as a future drug in cancer chemical treatment due to its potent activity against the multiple cancers. This report aims to summarise recent research into the phytochemistry, the medicinal properties and therapeutic mechanisms of

Combretum spp. and thereby to highlight gaps in the literature and the direct future research into this important genus (Nitu Singh et al.,2010).

ETHNOPHARMACOLOGY

As the vast majority of the Combretum spp. are native to southern Africa, the ethnobotanical avails of those species have been extensively reported. South African Combretum plants have been availed traditionally for various diseases and ailments such as snake and scorpion bites, mental issues, the heart problems, fever, pain and microbial infections. These plant species are prepared for herbal use as decoctions and the hot water infusions, or may be mixed with foods (Kaushik et al.,2009).

PHYTOCHEMICAL SCREENING OF A MEMBER OF COMBRATACEAE

Qualitative and Quantitative Phytochemical Analysis

The Phytochemical analysis of the plant material was performed according to the tested methods of Evans (2009), Harborne (1998) and Sofowara (2008) with the slight modifications. The Total Alkaloid Determination as Marker Substance This was according to the method delineated by Evans (2009) with slight modification. A 100 g of the powdered plant material was bioextracted by cold maceration using 70% methanol. The material was extracted by straining and filtration with the Whatmann No. 1 filter paper for three days with fresh solvent added every day. The filtrates were combined and the solvent removed by placing it in an oven set at 40 °C. The dried extract (0.1 g) was keenly macerated with 10 % acetic acid filtered and the pH reduced to 10 availing ammonia and extracted (three times) with chloroform by means of partitioning. The chloroform layers were combined in a previously weighed beaker and evaporated to dryness and the beaker weighed again. The difference in the weight of the beaker was considered the total alkaloids (Penpan Wetwitayaklung et al,2007).

Mineral Content Analysis- Sodium and potassium were analysed on the samples digested with hydrochloric acid, using Flame Photometry according , the Calcium was estimated using EDTA titration method. Spectrophotometric methods were availed to determined cupper, and phosphorus (AOAC (1990). Selenium, mercury, the arsenic, magnesium, manganese, zinc, iron, and phosphorus were analysed availing atomic absorption spectrometry (AAS). Acute Toxicity Determination Acute toxicity was determined as described by researchers in the year 2006(Manipal et al.,2017).

MICROSCOPY

Micromorphohe logical Study of the Foliar Epidermis Foliar epidermis of the adaxial (upper surface) and the abaxial (lower surface) surfaces of the leaves were prepared by clearing method. The leaf samples were cleared by soaking in the commercial bleach containing 3.5 % sodium hypochlorite for 18 hr. Then, the epidermal strips of the leaf samples were keenly scrapped gently with the aid of a pair of forceps and placed on the clean slide, and then stained with Safranin solution and covered with the cover slip. The slides were viewed under a light Olympus Tokyo (Japan No.271961), the microscope at x40, x100 and x400 magnifications and the photomicrographs were taken with a Motican Camera 2.0(Krishnamurty,1988).

Quantitative Microscopy- Determination of Leaf Constants the method delineated by few researchers was slightly modifies and used for the quantitative microscopy of the leaves. Fresh leaves of the Combretum platypterum were selected for the microscopical studies. Microscopic sections of the part of the leaf between the mid-rib and the precise lamina were cut with the help of micrometer. Numerous temporary and the permanent mounts of the microscopical sections of the leaf specimens were made and examined microscopically for its stomatal structure, the epidermal pattern, vein islet pattern, vein termination pattern and palisade ratio. The Histochemical studies using staining reagents on transverse sections and on leaf powder were undertaken (Figure-2).

Pharmacognosy is a branch of science that deals with studying the medicinal properties of plants (Dr. S. Sreeremya,2024a), by treating the plants with different extraction techniques(Dr. S. Sreeremya,2026a). Like soxhlet extraction, simple distillation, maceration (Dr. S. Sreeremya,2026b). The branch of pharmacology, biotechnology also promotes the field of pharmacognosy in a positive way (Dr. S. Sreeremya,2024b).There is a huge plant diversity (Dr. S. Sreeremya,2026c). Each plant families are unique in their own way (Dr. S. Sreeremya,2026d). There is a strong historical base for pharmcognosy (Dr. S. Sreeremya,2026e). The phytochemical assessment in several other plant species were analysed (Dr. S. Sreeremya,2026g) .

Figure: 2

Figure: 3

PHARMACOGNASTICAL STUDY OF COMBRETUM INDICUM

The Macroscopic Evaluation

Done for the confirmation of its identity, determination of the quality and detection of adulteration was done by a visual appearance by the naked he eyes (Figure-3) (Wallis, 2002). The Photo documentation of the macroscopic characters was done. Other sensory characteristic features like the odour, taste, and feel of the drug to the touch were also observed.

The Microscopic study- The freshly collected Combretum indicum (L.) Leaf was cut into a very thin transverse section with a sharp blade and the sections were stained with the safranin. Transverse sections were photographed availing Zeiss AXIO trinocular microscope attached with a Zeiss Axio Cam camera under the bright field light. Magnifications of the figures are indicated by the scale bars.

The Powder microscopy- Fine powder of Combretum indicum (L.) Leaf was mounted in the Glycerine as well as with phloroglucinol and con. HCl. Gently heat the mixture and was observed under the Zeiss AXIO trinocular microscope attached with Zeiss Axio Cam camera under the bright field light.

Physicochemical Study Physical Standards

The air-dried leaf of the Combretum indicum (L.) were powdered finely and subjected to various analyses such as the Determination of moisture content, Determination of total ash, Determination of the acid-insoluble ash, Determination of water soluble ash, water-soluble extractive value, the ethyl alcohol soluble extractive value, methanol soluble extractive value, chloroform soluble bio-extractive value (Trease et al.,1996), Acetone soluble extractive value, Petroleum ether soluble extractive value and the ash analysis.

Preliminary phytochemical study: Various extracts were subjected to the preliminary phytochemical studies to know the presence of Proteins, Carbohydrates, the Tannins, Saponins, Flavonoids, Steroids, Alkaloids, Triterpenoids, Starch, Resins, the Phenolics, Ellagic acid.

The ash of the crude drugs were subjected to various chemical tests to find the inorganic components such as the Carbonates, Fluorides, Chlorides, Sulphates, Chromate, Phosphate, Potassium, Sodium, the Aluminium and Calcium. TLC fingerprint profile: For the TLC fingerprinting, methanol extract was prepared by extracting 2g of the powdered drug with the methanol (3 × 10 ml) at room temperature, the extracts were combined, filtered and evaporated on a water bath. 10 mg of this dried extract was redissolved in 1 ml of methanol and 15µl of it was implicated with the Camag Linomet IV applicator on a pre-coated silica gel G 60 F254 TLC plate (Merck) of uniform thickness of 0.2 mm. The plate was well developed in solvent system Chloroform: Methanol: Formic acid (8.8:0.5:0.2) and visualized

under the UV 254 nm, UV 366 nm and 550nm. The fingerprint profiles were documented with the aid of CAMAG Switzerland photo documentation unit Reprostar 3.

PH value: The measure of the pH is generally done with a suitable potentiometer known as the pH meter fitted precisely with two electrodes, one constructed of glass and sensitive to hydrogenation bioactivity and the other a Calomel reference electrode. The determination is carried out at 25° C (Patil et al.,2014).

CONCLUSION

These characteristics are fortuitous and the account for much of the traditional usage of Combretum spp. Indeed, consumption of the high antioxidant diets is associated with a decreased incidence of chronic and degenerative diseases encompassing cancer, cardiovascular disease, the neurological degenerative diseases, diabetes, the obesity and other features are being reviewed in this paper.

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