The Feasibility of Using Wood Extracts in Medicine

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Based on recent studies, most of the bioactive behaviors and the majority of the medical properties (as in drugs, food additives, odorant, and flavoring compounds, *etc*.) of plant species are due to the overall antioxidant activity generated by the presence of certain flavonoid compounds, alkaloids, or other compounds with phenolic hydroxyl groups in the different parts of plants. In recent decades there has been an expansion of the types of the plants cultivated in various parts of the world. Therefore, we suggest work to evaluate the chemical composition from wood extracts and to determine whether or not they can be effective in pharmaceutical products as nature-based medicinal components, taking advantage of the antimicrobial activity often observed in such extracts.

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Wood as a Source of Natural Products

People have been using herbs for medicinal purposes since the dawn of history. The use of herbal medicine can be traced back to at least 5000 years. Nowadays, more than 85,000 plant species have been documented for medical use globally. The World Health Organization (WHO) estimates that almost 75% of the world's population has therapeutic experience with herbal remedies.

In general, softwoods have higher extractives content than hardwoods. Most of the extractives in both softwoods and hardwoods are located in the heartwood, and some are responsible for the color, smell, and durability of the wood. The qualitative difference in extractive content from species to species is the basis of chemotaxonomy (taxonomy based on chemical constituents). They can be removed from the wood by neutral solvents such as water, alcohol, benzene, acetone, and ether. They are found in higher concentrations in the bark of most woods. It is widely thought that biosynthesis of such compounds in the bark is favored by evolution, since it may slow or prevent pathogen invasion. Their production is under strict genetic control, and some individual compounds are limited to individual species. Compounds such as these are broadly classified as secondary metabolites. In fact, until relatively recently, they were considered waste products of tree metabolism.

Various analytical studies such as HPLC, GC, GC/MS, NMR, and FTIR have confirmed and identified the chemical composition of wood extracts. Plants produce secondary compounds, which protect them against attacks by pathogens like fungi, bacteria, and insects. Observations of resistance to degradation have led researchers to study and identify active compounds that are useful in pharmaceuticals and traditional medicine. Antibiotic resistance in these pathogenies has been increased in recent years. Subsequently, some extracts of higher plants (timber trees) have been isolated as pure

compounds for commercial pharmaceutical applications, and they may be regarded as phytomedicines.

Many studies have been pursued to shed light on the bioactivity of extracts from wood. Wood extracts have many uses in pharmaceutical purposes around the world. In studies of the extracts of 14 eastern North American hardwood tree species, 72% showed activity against *Staphylococcus aureus* (methicillin-sensitive), 36% against *Bacillus subtilis*, and 43% against *Mycobacterium phlei*. In addition, the wood extracts presented moderate activity against the fungi *Candida albicans*, *Saccharomyces cerevisiae*, *Cryptococcus neoformans*, *Trichophyton mentagrophytes*, *Microsporum gypseum*, and *Aspergillus fumigatus*. Furthermore, phenolic and flavonoids compounds isolated from wood have shown good anticancer properties, especially the prenylated flavonoid compound, which inhibited of 5a-reductase and melanin biosynthesis in B16 melanoma cells.

Additionally, polyphenolic extracts and essential oils obtained from the wood extracts from different species such as *Quercus robur*, *Pinus roxburghii*, *Conocarpus lancifolius*, *Tecoma stans*, and *Callistemon viminalis* and many other species have been examined *in vitro* for their antioxidant capacity using the Trolox equivalent antioxidant capacity (TEAC) method, the activity of antioxidant enzymes, the total antioxidant capacity in plasma, and the DPPH. In addition to markers of oxidative damage to proteins, DNA, and lipids and SOD, CAT, and GPx were determined in the erythrocytes.

Moreover, a number of essential oils are derived from the wood of various species of *Juniperus* and *Cupressus* worldwide. Distilled volatiles from the heartwood of *Juniperus* are used in the production of the majority of perfumes and colognes on the world market. More than 400 fragrances, or almost 60 percent of the fragrances produced, contain cedar wood oil. Several are important commodities in the international market. In addition, tannins, which are polyphenols obtained from various parts of different plants belonging to multiple species, are used for tanning; they are obtained from plants like wattle (*Acacia sp.*), oak (*Quercus sp.*), eucalyptus (*Eucalyptus sp.*), birch (*Betula sp.*), willow (*Salix caprea*), pine (*Pinus sp.*), and quebracho (*Scinopsis balansae*). The remedial values of tannins include application on burns to heal the injury and on cuts to stop bleeding. Tannin's ability to form a strong 'leather' resistance on the exposed tissues helps in protecting the wounds from being affected further.