



Aquilaria Crassna (Agarwood): Study of Pharmacological Activity and Medical Benefits

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Abstract

Aquilaria Crassna an important medicinal plant. It is one of the most growing species of the Thymelaeaceae family. It's found in rainforests of Southeast Asia such as Indonesia, Bangladesh, Malaysia, Thailand, Cambodia, Laos, Vietnam, and Northeastern India. It is a valuable plant on earth because of its wide medicinal properties. Agarwood is consumed as a pathological product as well as it is also an important ingredient in medicine. This review provides significant information regarding the medicinal properties of drugs for the treatment of various diseases such as insomnia, stress, skin damage, stork, arthritis, vomiting, cardiac disorder, cough, asthma, heart attack, kidney failure and agarwood as a treatment for cirrhosis of the liver and as the director or focus of other drugs. It has been used to treat lung and stomach tumors. The plant has several pharmacological activities known as anti-oxidant, antinociceptive, laxative, sedative, antihyperglycemic, thrombolytic, antibiotic, anti-ulcer protective. Each part of the agarwood (Aquilaria Crassna) tree has beneficial properties that can serve mankind. The whole plant can be extensively studied for future possibilities. This review highlights to Pharmacological activity of agarwood (Aquilaria Crassna) in human life and medical benefits at modern civilization.

Keywords: Aquilaria Crassna; Ingredient; Pharmacology; Phytochemical; Antioxidant

Introduction

According to the World Health Organization (WHO), about 80% of people in developing countries rely on traditional herbal medicine for basic healthcare needs. Recently, a wide range of plant-derived phytochemical ingredients for the treatment of cancer and their synthetic derivatives have been suggested. Further, it is estimated that 25% -48% of the approved therapies approved by the Food and Drug Administration (FDA) are obtained from plants. Amazingly, more than 10,000 phytochemicals have been identified and used in cancer treatment because of their well-established structure and wide spectrum of biological activities [1-2]. Phytochemicals, such as paclitaxel, vincristine, and camptothecin have become major and

significant sources for chemotherapy in cancer treatment protocols, providing the most successful alternative and complementary anti-cancer survival system [3,4]. Also, there is a worldwide green revolution that has emerged from the notion that final herbs are safer and less harmful than synthetic drugs to the human body. In addition, that they have the benefit of natural ingredients less than synthetic compounds on a long-term basis. Nevertheless, failure to detect the chemical profile of the plant and safety assessment can lead to detrimental effects on health. Furthermore, it is well-documented that about 1,500,000 plants have been investigated, most of them containing toxic ingredients that indicate that medicinal herbs should be used with caution and toxicology investigations to increase knowledge about the ethnopharmacological uses of plants [5]. The species of

Aquilaria (Thymelaeaceae), Consisting of about 15 species distributed with the rain forests of Southeast Asia, where only 8 species were reported for the formation of agarwood. Agarwood, also known as God Shaver wood, is commonly used for gaharu in Malaysia, jinkgo (or jinkoh) in Japan, Adlerholtz in Germany, bois d'aigle in France, pau d'aguila in Portugal, ood (or oodh of oudh) in the United Arab Emirates (UAE), eaglewood, aloeswood and gaharu in Indonesia, chen xiang in China, and most of the sub-Indian continent Agarwood are similar to Bangladesh [6]. Globally, there are two main market areas for the Agarwood service: a) markets in northeast Asia and Taiwan, Japan and South Korea, and b) countries in the Middle East, especially the Arabian Peninsula. The international market price of agarwood chips varies from US \$ 20 per kg to US \$ 6,000 per kg depending on its quality [7]. The value of the distilled agar oil is valued at US \$ 30,00 kg and the wood itself is up to US \$ 10,000 per kg. Agarwood is a fragrant and highly prized wood found in the Thymelaeaceae family of *Aquilaria* species (the largest evergreen native of Southeast Asia). *Aquilaria crassna* (Agarwood) from the Thymelaeaceae family is one of the world's most valuable plants and has been used for thousands of years in medicinal, aromatic and preparations herb [8,9]. It is a large evergreen tree, which is 15 m - 30 m in length and 1.5 m - 2.5 m in diameter and is capable of producing aromatic agarwood resin when wood is attacked or injured by pathogens [10]. According to Pornpunyapat, et al. there is 15 species of agarwood around the world [11]. However, it is only the infected wood that turns into agarwood. Agarwood is the result of a plant defense system that is aided by wounds, fungal attacks and possibly insects. In general, *Aquilaria malaccensis* (*agallocha*), a species such as *crassna*

and *A. sinensis* has been widely explored for their chemical regulators (resin and essential oils), but they have been given less focus on pharmacological activities. *Aquilaria* products, including agarwood oils, leaves and seeds, were advised in traditional Asian medicine for the treatment of vomiting, rheumatism and asthma. In traditional medicine in Malaysia, coconut oil is used as an ointment to cure body aches [9]; (Jin-Koh) is used in Japan for traditional antihypertensive drugs as a sedative or tranquilizer to detoxify the body and maintain abdominal health [12]. In addition, much attention has been paid to phytochemical investigations and properties of active ingredients from these plants in recent years. *Aquilaria crassna* has been identified as a convenient and useful source of biological functional components, such as phenolic, flavonoids, benzophenones, xanthenes and sesquiterpenes [13]. In fact, several studies have focused on the biological activities of *Aquilaria crassna*. Specifically, it seems to have anti-ischemic, anti-fungal and anti-bacterial effects [14-16]. Agarwood, the results of the plant defense system which is assisted by wounds, fungal attacks and possibly insects with keeping this in mind.

Phytochemistry

Agarwood is considered as a pathological product produced by fungal invasion of the host [17]. Since that time 1938, few workers have been studying agar formation and agar regions have been reported to be associated with mold and decay fungi. Some individuals with different fungal species may exhibit pathogenesis as they relate to agar regions, others appear to be saprophytic in different Ecographical situations [18].

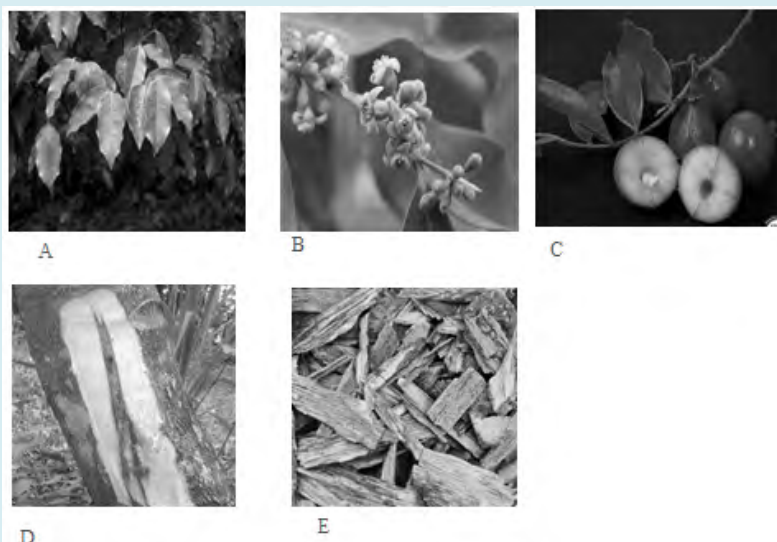


Figure 1: *Aquilaria* spp. (A) leaves (*A. subintegra*), (B) flowers (*A. malaccensis*), (C) fruits (*A. malaccensis*), (D) agarwood (resin) formation (Thymelaeaceae), and (E) Resin-saturated wood chips (*Aquilaria crassna* is a mixture of several species).

Maheshwari, et al. Separation of three new sesquiterpenoid furanoids from the selinene group from agarwood oil obtained from fungal-infected plants, and their formation and perfect configuration degradation were determined by studies and physiological measurements [19]. Verma, et al. found that degradation studies and physiological measurements were supported by the unlimited synthesis of ketone exposed to the assignment of a sesquiterpene alcohol isolated from infected agarwood essential oils [20]. According to Nagasima, et al. Two more sesquiterpene alcohols from Indonesian Agarwood oil detected the presence of jincohl II and jinkoheremol [21]. Ishihara, et al. a sample of agarwood oil featured seven new sesquiterpins based on the guaiane skeleton [22]. Variations in vesicular-arbuscular mycorrhiza association in tree species and the combination of amino acids due to pathogenesis were also studied [23]. Tamuli, et al. investigated the differences in the synthesis of healthy, naturally infected and artificially derived oils from agarwood [24].

Literature Review of Pharmacological Activities

Antioxidant Activity

Miles and Grisham investigated the antioxidant potential of ethyl acetate extract of agarwood leaf at different concentration of the test compounds (500 µg / ml, 1000 µg / ml, 1500 µg / ml and 2000 µg / ml) [25]. It was found that the lower concentration range showed anti-oxidant effect. However, the activity was reversed with greater concentration. Sharma and Bhat reported the free radical activity of agarwood using 1,3-diphenyl-2-picrylhydrazyl radicals. Standard ascorbic acid at a concentration of 0.08-5 g / ml reduces DPPH oxidation by about 30-80% [26]. The IC₅₀ values in the anti-oxidative activities of ascorbic acid and agarwood extract were found to be 2.19 g / ml and 47.18 g / ml, respectively. Miniyar, et al. investigated the antioxidant activity of agarwood of ethyl acetate extract in vitro for various concentrations for the inhibitory effect of nitrite induced oxidation of hemoglobin on human blood haemolysate [27]. The results show strong antioxidant outcome of EAA in the concentration range of 500-3500 µg / ml. However, at higher concentrations of these compounds, pro-oxidant activity can be observed.

Anti-Diabetic Activity

Omar, et al. Evaluate the effect of methanol and aqueous crude extracts of agarwood leaf on streptozocin induced diabetic rats with 20% glucose water for weeks, compared with treatments administered orally administered crude methanolic and aqueous extract, from 250 to 500 mg / kg and 0.2 mg / kg. Blood glucose levels, body weight, glycosylated

hemoglobin, glycosylated in muscle and liver, lipid profile status was measure and pancreatic histopathology was completed 6 weeks after treatment and compared to normal control [28]. In vitro experiments, the effects of methanol and aqueous refining at concentrations ranging from 100 µg / ml to 1000 µg / ml were strengthened with α-glucosidase and amylase inhibitory activity. This expected result suggests that the Malaysian agarwood leaf extract represents potential dietary supplements that allow for flexibility in useful diet planning and to automatically reduce the number of diabetic patients in the global population, suggesting that the agarwood leaf is a promising potential anti-diabetic agent.

Anti-Inflammatory Activity

Suebasasana, et al. Anti-inflammatory activity was tested (as a control) by extraction of orally administered doses (800 mg / kg) to treat water [29]. Vakati, et al. reported anti-inflammatory activity of agarwood oil by edema driven by carrageenan and erosion in the method of membrane stabilization of human red blood cells and locally on the left subcutaneous region of the rat, 1.5 milliliters of carrageenan were used [30].

Anti-Bacterial Activity

Rahman, et al. investigated Agarwood and Citrullus lanatus seed oil agar compare well with antibacterial activity and their standard ciprofloxacin by propagation method [31]. The test organisms used are Escherichia coli, Enterococcus faecalis, Staphylococcus aureus, Pseudomonas aeruginosa. The study revealed that both had antibacterial activity.

Antimicrobial Activity

Mansi, et al. reported the extract of aqueous and methanol, including dry powder of leaves and dried powder of agarwood, against resistant activities such as Shigella flexneri, bacillus brevis, yeast, dermatophytes and helminth [32]. Anti-microbial activity was done for different types of agar wood leaf.

Works as Antidepressants

Agarwood leaves act as anti-depressants. Leaves contain agarospirol which act as anti-depressants. It helps to depress the central nervous system which causes stress and restores physical well-being.

Anti-Aging Skin

Agarwood leaves can also be anti-aging skin. Agar wood leaf tea is used to remove mercury in the body, thus reducing the risk of nerve disease and can prevent skin aging. When poisonous mercury can be removed from the body with agar

wood leaf tea, it makes the skin healthy and stained or free from aging of the skin.

Soothe Sleep Disorders

Agarwood leaves can also reduce sleep disorders. Agarwood leaf tea has the effect of helping to soothe and reduce the symptoms of stress, so it can sleep more peacefully and longer.

Bad Breath and Mouth Odor (Halitosis)

Generally, agarwood is used to reduce bad breath and mouth odor. Almost 80% of cases have a bad odor from oral disease and gum. In all these cases, the agar resin works amazingly well. This problem does not work with gastric problems such as chronic gastritis, acidity, acidity etc. So, it can take regular agarwood for better results in oral disease.

Traditional Medicinal Benefits of Agarwood

Agarwood has been used for various purposes around the world for thousands of years. Its use has been reported in Ayurvedic and traditional East Asian treatment practices, including the Shahi Muslim and the Sushrut Samhita [33]. From a religious and sacred point of view, both the Bible and Islamic hadith have been mentioned many times (the alleged traditions of the Prophet Muhammad S.A.W) and have been used in various religious ceremonies in Vietnam, Japan, China and Buddhist religions. Traditionally, the leaves, bark and root of *Aquilaria crassana* heartwood are used for their medicinal properties. Agarwood is used to relieve spasm and reduce fever. Agarwood is used as an absorber against stomach complaints, asthma, shortness of breath and diarrhea. Agarwood is also an aphrodisiac and a carminative. In western, Chinese and Indian medicines agarwood incense is used against cancer, especially in the thyroid gland. Agarwood is applied as an anti-abdominal complaint, asthma, respiratory and diarrhea attacks and in China as aphrodisiac and carminative. The graded agarwood enters the various preparations used especially during and after delivery and is used for arthritis, knee and abdominal pain. Agarwood's decoctions are said to have anti-microbial properties, e.g. *Mycobacterium tuberculosis* and against *Shigella flexneri*. Because of the inorganic properties, agarwood is a good herbal treatment for dealing with throat-related disorders such as inflamed throat. Agarwood is effective in strengthening essential organ heart and prolonging its function. Agarwood is quite useful for enhancing sexuality. Agarwood is effective in fighting grief before and after childbirth. Agarwood is useful preventing for dysentery and diarrhea. Agarwood is also used in the preparation of creams and lotion. Agarwood is effective in preventing muscular ailments like spasms, which are often

seen in the toes, hands, etc. It helps to prevent the sudden spread and contraction of muscles, muscles or groups of organs. Agarwood also neutralizes colic, which involves the sudden generation and stopping of abdominal pain.

Discussion

Previous studies, it is believed that agarwood formation is a complex process that undergoes various physiological changes to address external stimuli in biological or abiotic form in *Aquilaria* plants. For the decades, natural herbs have been a source of remedy and drugs lead [34]. Natural products condition the inspiration for sorts of strategies used in the diversity orient synthesis of the novel small moiety libraries. An enhancing body of the evidence supports the effectiveness of these planning of the operation for recognizing new biologically active moiety [35]. Agarwood is an important medicinal herb, one of the most expensive and valuable commodities in the world and the most widely cultivated species of the Thymilaceae family. Whole plant has been used for human medication. A review of the literature on this medicinal herb in detail describes its traditional anesthetic uses as insights anti-asthmatic, anti-inflammatory, antidiarrhoeal, aphrodisiac, frosty, bitter, cardiogenic and stimulant. Oil massage with Agar wood oil is effective in rigors in fevers and used in perfumes, the woods burn for fragrance and used in various cosmetic formulations [36]. Pharmacologically reported various activities includes antioxidant, hepatoprotective, antidiabetic, anti-inflammatory, analgesics, sedative, central nervous system, anti-pyretic, anti-bacterial, laxative, antihistaminic and anti-microbial activities. Phytochemically, it is helpful to discover new sources of economic as well as new therapeutic agents

Conclusion

There is no doubt that agarwood is the more valuable tree because it's all portion of the plant used as a valuable product. Moreover, *Aquilaria* plants produce at least 19 species of agarwood, which means that new compounds need to be found in large quantities of agarwood and *Aquilaria* plants. As a natural sedative, it has outstanding as well as drizzling performance to remove insomnia, stress, skin damage, stork, high blood pressure, heart attack, kidney failure etc. Due to its excellent biological properties as well as antioxidant characteristics, it can be surmised that agarwood will act as fidelity tonic or active instrument to reduce glucose level in blood as well as glinide regeneration to produce more insulin. Agarwood should be carried out to active ingredients and compounds, which not only contributes to understanding the scientific nature of traditional application of medicine, but also to the development of new drug research and agarwood products.

Conflict of Interest

The authors declared no conflict of interest

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