

Avicennia marina medicinal application - Review

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Abstract: Mangroves are the ecologically important coastal wetland. In the tropics, they are especially rich in flora and fauna. They are one of the most productive ecosystems of great ecological and economical significance. *Avicennia marina* commonly known as grey mangrove are white mangrove is classified in the family of Acanthaceae. In the present article the various medicinal applications of *Avicennia marina* were represented. This the review outlines that the *A.marina* pose a number of medicinal applications such as phytochemical compounds medicinal uses, ethnomedicinal uses, Antioxidant defense mechanisms etc.

Keywords: *A.marina*, grey mangrove, phytochemical compounds, ethnomedicinal, antioxidant.

1. INTRODUCTION

India has a rich heritage of knowledge on plant based drugs both for use in preventive and curative medicine. A country like is very much suited for development of drugs from medicinal plants. Mangrove plants have been used in folklore medicines and extracts from mangrove species have proven inhibitory activity against human, animal and plant pathogens (Saranraj and Sujitha, 2015). The mangrove cover is larger and more widespread on the east coast compared to the west coast because of its distinctive geo-morphological setting. These differences in mangrove cover can be attributed to two reasons: i) the East coast has large estuaries with deltas formed due to runoff and deposition of sediments, where as the west coast has funnel-shaped estuaries with an absence of deltas; and ii) the East coast has gentle slopes with extensive flats for colonization by mangroves, where as the west coast has steep slopes (Kathiresan, 2010).

Since mangrove forest resources are the breeding ground for marine fishes, an integrated approach ensuring nondestructive harmonious interactions between the marine and the terrestrial resources and among socio-economic conditions, cultural values, agricultural production and environmental conditions should be applied. Such as

- ❖ Integration of existing aquaculture systems such as polyculture, floating pens/cages, cage culture, raft culture and on bottom culture systems like pens with the silvofishery models (Huitric *et al.*, 2002).
- ❖ Intensively run shrimp ponds (linked to sea water by channel) behind the mangroves.
- ❖ Silvofishery models are site-dependent and integrated into coastal zone management, requiring 20:80 ratios between pond and forest area.
- ❖ Shrimp hatcheries require high salinities and are best suited close to brackish water habitats while grow-out ponds should be sited in inland or fresh water areas to further reduce the pressure on mangroves.

The mangroves areas of 4.82 ha have been converted for aquaculture, which represented 0.01% of mangroves converted for the development of shrimp farming. The mangroves in Pichavaram reserve forest have not been affected due to the development of aquaculture. However, environmental impact of shrimp farming is becoming a serious concern due to its rapid expansion.

Mangroves are the ecologically important coastal wetland. In the tropics, they are especially rich in flora and fauna. They are one of the most productive ecosystems of great ecological and economical significance. As mangroves need warm conditions for development and survival, they are found only in tropical climates. Medicinal plants are known to produce certain bioactive molecules which react with other organisms in the environment; inhibiting bacterial or fungal growth (Bandaranayake, 2002). Mangroves have important phytochemical contents such as alkaloids, saponins, glycosides, tannins and flavonoids (Hanani *et al.*, 2005). One function of these phytochemical contents can protect against free radicals. Free radicals found in the environment could be tackled by antioxidant compounds. Antioxidant compounds exist in many plants such as seagrass seaweed and mangrove. Antioxidant also exists in mangrove (*Avicennia marina*). Extracts and chemicals from mangroves are used mainly as folkloric medicine, insecticides, pesticides, and these practices continue until today (Bandaranayake, 2002).

Avicennia marina, commonly known as grey mangrove or white mangrove, is a species of mangrove tree classified in the plant family Acanthaceae (formerly in the Verbenaceae or Avicenniaceae). It grows as a shrub or tree to a height of three to ten meters, or up to 14 meters in tropical regions, growing in the saline intertidal zone of sheltered coast lines. It has been reported to tolerate extreme weather conditions and high winds (Bobbarala *et al.*, 2009). Avicenniaceae family is a member of true mangrove plants, which has one genus, 11 species and several sub species. *Avicennia marina* is the most current species among these plants in Iranian mangrove forest. *A.marina* is a mangrove tree species that is extraordinarily adaptable with a flexible growth pattern. *A.marina* grows mainly in the Indo-Pacific regions within a latitudinal range of 30° N to 30° S (Duke).

2. PHYTOCHEMICAL COMPOUNDS IN AVICENNIA MARINA

The common chemical constituents present in the mangroves are aliphatic alcohols and acids, aminoacids, alkaloids, carbohydrates, carotenoids, hydrocarbons, free fatty acids, lipids, pheromone, phorbolsters, phenolics and related compounds, steroids, triterpenes and their glycosides, tannins and other terpenes (Revathy *et al.*, 2013). In tropical Africa, the tannin-rich leaves of the mangroves serve in the cure of malaria (Lawal *et al.*, 2015). Flavonoids and tannins activate the pancreases to boost insulin secretion, via an anti-hyperglycemic action. Tannins help to reduce oxygen decrement in blood and curtail the lead up to oxidation stress, a major problem for diabetics (Hardoko, 2016).

3. MEDICINAL USES

The antibacterial activity of *Avicennia marina* leaf extracts in petroleum ether, chloroform, ethyl acetate and ethanol against *Escherichia coli*, *Pseudomonas species*, *Proteus species*, *Shigella species* and *Staphylococcus species* (Abeyasinghe and Wanigatunge, 2006). *Avicennia marina* and *Avicennia officinalis* to be rich in secondary metabolites and possess antioxidant and antibacterial activity. The extracts of *Avicennia marina* from leaves and aerial parts have been reported to possess antiviral (Zandi *et al.*, 2009) and anti-microbial activities (Bobbarala *et al.*, 2009). Its bark and roots are used as aphrodisiac; the wood of plant is used for the treatment of snakebites and the extract of the seed for sores. Young fruits are used as poultice for wounds and leaves for skin ailments.

4. ANTIGLYCATION ASSAY

It is a nucleophilic reaction in which protein amino group or lipid molecule is covalently linked with the carbonyl group of reducing sugar such as glucose and fructose to form glycated product called Glycation, Glycosylation, Non-enzymatic reaction or Advance glycated ends product (AGEs). It is posttranslational modification of protein which occur by hyperglycemia and long term complication such as Cataract, Neuropathy, Nephropathy, Wound healing, Alzheimer's disease (AD) etc. functioning of biomolecules. The method of anti-glycation activity is previously published. (Mahera *et al.*, 2011).

5. ETHNOMEDICINAL USES

The available literatures have reported that most of the *Avicennia* species have been traditionally used as a medicine for a wide array of diseases worldwide by the local communities inhabiting the mangrove forest (Bandaranayake, 2002; Das *et al.*, 2016). *A.marina*, *A.nitida* and *A.officinalis* are reported to have been widely used against treatment of many diseases which are documented and presented in Table-1. A number of reports are available for ethnomedicinal uses of different disease (Rollet, 1981; Fauvel *et al.*, 1993; Bandaranayake, 1998, 2002; Ito *et al.*, 2000; Sumithra *et al.*, 2011a; Thirunavukkarasu *et al.*, 2011; Kar *et al.*, 2014b).

6. ANTIOXIDANT DEFENSE MECHANISMS IN MANGROVE PLANTS

A limited number of plant communities comprise of trees, shrubs and herbs are capable of surviving in these hostile environmental conditions as exemplified by water logging, high salinity, low oxygen, high wind and high temperature (Kathiresan and Bingham, 2001). About 80 species of mangrove plants are known worldwide. The important genera of mangrove plants comprise *Acanthus*, *Avicennia*, *Aegiceras*, *Exocariceae*, *Rhizophora*, *Kandelia*, *Ceriops*, *Bruguiera*, *Xylocarpus*, *Sonneratia*, *Suaeda*, which encompass more than one species each. These mangroves represent a unique plant community possessing an adaptive capability in terms of morphological, anatomical, physiological and molecular mechanisms to cope with various environmental stresses (Dasgupta *et al.*, 2010).

Table 1: Ethnomedicinal uses of *Avicennia* sp

S.No	Species	Parts	Ethnomedicinal uses	Reference
1.	<i>A.africana</i>	Bark/Stem	Antitumor, antiulcer, cure for thrush, gangrenous wounds, lice, mange, ring worms and skin parasites.	Ito <i>et al.</i> , 2000
2.	<i>A.alba</i>	Bark/Stem	Contraceptive, anti-fertility, paralysis, scabies, rheumatism, aphrodisiac, asthma, skin disease, sexual disorders, snake-bites, analgesic and antiulcer.	Bandaranayake, 1998; Kar <i>et al.</i> , 2014b
3.	<i>A.germinans</i>	Leaf, Fruit, Bark/Stem	Astringent, antihaemorrhagic, malaria, antidiarrhetic, anti-tumours, treatment for haemorrhage, haemorrhoids, rheumatism, swellings, throat ailments.	Bandaranayake, 2002; Rollet, 1981; Fauvel <i>et al.</i> , 1993
4.	<i>A.marina</i>	Leaf, Fruit, Bark/Stem	Antiulcer, treatment for rheumatism, small pox, skin diseases.	Bandaranayake, 2002; Fauvel <i>et al.</i> , 1993
5.	<i>A.nitida</i>	Leaf, Seeds, Bark/Stem	Cure for thrush antitumor, antiulcer	Bandaranayake, 2002
6.	<i>A.officinalis</i>	Bark/Stem	Contraceptive, astringent, diuretic, antiulcer, treatment for snake bites, rheumatism, small pox, skin diseases, hepatitis, leprosy, antitumor, Bronchial asthma, antibacterial, gastroprotective, aphrodisiac, boils and abscesses	Sumithra <i>et al.</i> , 2011a; Thirunavukkarasu <i>et al.</i> , 2011
7.	<i>A.tomentosa</i>	Fruits, Leaf Roots, Seeds Leaf, Bark	Treatment for rheumatism	Bandranayake, 2002.

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