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Comparative Analysis of Antioxidant Activity of Avicennia Alba and Avicennia Officinalis Collected From Chinchani Tarapur Village of Palghar District, Maharashtra, India

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Abstract

Mangrove forests are trees, shrubs and ferns that occupy the intertidal areas between land and sea of tropical and subtropical regions. These unique ecosystems are not only ecologically significant but also possess substantial pharmacological potential due to their rich phytochemical composition. Avicennia alba and Avicennia officinalis are two examples of mangroves. Antioxidants are the compounds which protect living cells from damage caused by free radicals. Free radicals are highly unstable molecules that contribute to cell damage, inflammation & development of chronic diseases like heart disease, cancer & age related conditions. Antioxidants prevent or slow the progression of such disease, support overall health and contribute to healthy aging, cognitive function and healthy gut microbiome. In present study, methanolic and aqueous leaf extract of Avicennia alba and Avicennia officinalis was prepared. Antioxidant activity (% free radical scavenging activity) of these extracts was determined by using DPPH (2-Diphenyl-1-picrylhydrazyl) assay. % free radical scavenging activity of methanolic leaf extract and aqueous leaf extract of Avicennia alba was found to be 80.1980% & 70.2970% respectively. % free radical scavenging activity of methanolic leaf extract and aqueous leaf extract of Avicennia officinalis was found to be 82.178% & 75.2475% respectively. Highest % free radical scavenging activity was observed in methanolic extract of Avicennia officinalis followed by methanolic extract of Avicennia alba. Aqueous extract of Avicennia officinalis has more % free radical scavenging activity than aqueous extract of Avicennia alba but less than methanolic leaf extracts.

Keywords: *Mangroves, Avicennia alba, Avicennia officinalis, Antioxidant, DPPH*

Introduction

Mangrove ecosystems are rich in biodiversity and provide critical ecological services, including coastline protection, carbon sequestration, and habitat for numerous aquatic and terrestrial species. Among mangrove species, *Avicennia alba* and *Avicennia officinalis* (Family: Acanthaceae) have drawn considerable attention not only for their ecological importance but also for their bioactive potential in traditional medicine. *Avicennia officinalis* is an evergreen mangrove tree, widespread in the Indian subcontinent, Southeast Asia, and adjoining coastal regions. It is typically 8–18 m tall, and different plant parts—leaves, bark, fruits—are used in various ethnomedicinal applications. Traditional uses range from treating rheumatism, ulcers, diarrhea, bacterial, fungal, and viral infections (Swagat Kumar Das, 2018). *Avicennia alba* is another mangrove species with documented medicinal uses. Extracts from its leaves and bark have been reported to exhibit antidiabetic, anti-inflammatory, analgesic, cytotoxic, and antimicrobial properties. For example, ethanolic leaf and bark extracts of *A. alba* show enzyme-inhibiting (α-amylase, α-glucosidase) and free-radical scavenging activities in vitro, with notable phenolic and flavonoid content (S.Das, 2020, F Irnawati,2018). Oxidative stress—arising from an imbalance between reactive oxygen species (ROS) generation and antioxidant defenses—is implicated in many chronic diseases, such as diabetes mellitus, cancer, cardiovascular disorders, and inflammatory conditions. Natural antioxidants derived from plants, especially those adapted to harsh conditions (such as mangrove environments),

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are a promising source of molecules capable of neutralizing ROS, mitigating oxidative damage, and modulating redox-sensitive cellular pathways. In studies of S. Das (2018) with *A. officinalis*, both leaf and bark extracts have shown considerable in vitro antioxidant potential measured by DPPH, ABTS, and superoxide radical assays. Likewise, *A. alba* has shown strong scavenging activity in several assays; different extracts have yielded high phenolic/flavonoid contents and good antioxidant capacity (Nguyen, 2022, Torero 2018, Banerjee, 2008). In present study, antioxidant potential of these two plants was compared in methanol & aqueous leaf extract.

Materials & Methods:

Sample Collection & processing: Leaves of Avicennia Alba and Avicennia officinalis were from Chinchani Tarapur village (located at 19.87°N & 72.7°E), Taluka/ District- Palghar, Maharashtra, India. Leaves were washed & shed dried at room temperature. Dried leaves were grinded to fine powder.

Extract preparation: Extracts were prepared by using 15grams of dried powder & 300 ml of solvents (Distilled water and methanol), through soxhlet extraction method. Then extracts were dried by evaporation & stored in the refrigerator for further use.

Antioxidant Activity:

DPPH (2-Diphenyl-1-picrylhydrazyl) assay was used to determine *in vitro* antioxidant activities of methanolic & aqueous leaf extracts of *A.alba* & *A. officinalis* using (Kavitha et al., 2018).

Following tubes were prepared:

Test control- 1 ml of leaf extract (100 ug/ml) was mixed with 3 ml of 0.1mM DPPH.

Control Tube-1 ml of methanol was mixed with 3 ml of 0.1mM DPPH.

Methanol was used as a blank. The 1,1-diphenyl-2-picrylhydrazyl (DPPH) free-radical scavenging assay was carried out in triplicate where the odd electron of the nitrogen atom in DPPH is reduced by receiving a hydrogen atom from the antioxidants. All the tubes were incubated in the dark for 20-30 minutes & Absorbance was measured at 520 nm. Ascorbic acid (1 mg/ml) was used as a reference compound. Radical scavenging activity was expressed as the inhibition percentage of free radical by the sample and was calculated using the formula:

DPPH scavenging activity (%) = $(A_0 - A_1) / A_0 \times 100$

Where A_0 is the absorbance of the control sample, and A_1 is the absorbance of a sample.

Results & Discussions:

The total antioxidant potential is a relevant tool for investigating the relationship between dietary antioxidants and pathologies induced by the oxidative stress. It gives the additive antioxidant properties of plant foods. Ascorbic acid is an antioxidant with therapeutic properties, which plays an important role in activating the immune response, in wound healing, in osteogenesis, in detoxifying the organism, in iron absorption, in collagen biosynthesis, in preventing the clotting of blood vessels, and in many other metabolic processes (Pisoschi and Negulescu, 2011). In present study, % Radical scavenging activity of aqueous & methanolic extract of *Avicennia alba* was found to be 70.2970% & 80.1980% respectively. % Radical scavenging activity of aqueous & methanolic extract of *Avicennia officinalis* was found to be 75.2475% & 82.1782% respectively. % Radical scavenging activity (%) of Ascorbic acid (1 mg/ml) was found to be 77.2018%.

Table 1: % antioxidant activity of methanolic & aqueous extracts of *Avicennia alba & Avicennia officinalis*

Sr No.	Sample(Leaf extract)	% Radical scavenging activity (%)
1.	Methanolic extract of *Avicennia alba*	80.1980
2.	Aqueous extract of *Avicennia alba*	70.2970
3.	Methanolic extract of *Avicennia officinalis*	82.1782
4.	Aqueous extract of *Avicennia officinalis*	75.2475
5.	Ascorbic acid	77.2018

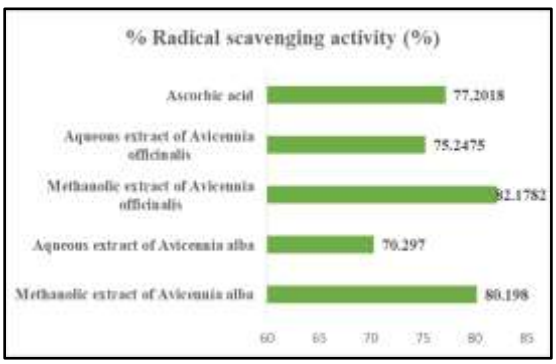

Figure 1: Comparative analysis of % free radical scavenging activity

Conclusion:

From present study it was concluded that methanolic leaf extract of *Avicennia officinalis* has the highest percentage free radical activity than methanolic leaf extract of *Avicennia alba*. Also aqueous leaf extract of *Avicennia officinalis* has higher free radical activity than aqueous leaf extract of *Avicennia alba*. But percentage free radical activity of both the mangroves in both leaf extracts was found to be more than Ascorbic acid. Therefore it was concluded that *Avicennia officinalis* as well as *Avicennia alba* have good antioxidant activity.

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