Medicinal and Nutritional Significance of Grey Mangroves Marine Plant: An Underutilized Resource

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Abstract

Grey Mangroves are widely distributed worldwide and provide a wide range of medicinal and nutritional benefits. These plants have been traditionally used to treat a variety of ailments including cancer and diabetes. The objective of the article is to review the current research on the significance of grey mangroves in all over the world especially Pakistan and suggests ways in which these resources can be better utilized to improve health outcomes. While the medicinal and nutritional properties of grey mangroves have been recognized for centuries, their potential has yet to be fully realized. Further research is needed to identify, isolate the active compounds to develop novel drugs and nutritional supplements. Finally, efforts should be made to increase public awareness of the health benefits of grey mangroves, so that more people can benefit from their medicinal and nutritional properties.

Keywords: *Avicennia marina*, Grey Mangroves, Medicinal Properties, Medicinal Uses, Natural Remedies, Nutritional Role, Traditional Medicine

1. History and Background

The medicinal and nutritional value of grey mangroves has been known for centuries. Mangroves are an important part of the coastal ecosystem in Pakistan and have been used for centuries by local communities for their medicinal and nutritional value. In ancient times, mangroves were used to treat a variety of ailments, including fever, malaria, and skin conditions. The leaves of the mangrove tree were also used in traditional medicine to treat wounds and reduce inflammation. Mangroves are also an important source of food for many coastal communities in Pakistan. The roots, leaves, and fruits of the mangrove tree are all edible and are a source of essential nutrients such as proteins, carbohydrates, and vitamins. The leaves of the mangrove tree can be cooked and eaten as a vegetable or boiled to make a tea. The fruits are eaten both fresh and dried. The grey mangrove, *Avicennia marina* specie is also found in the Indo-Pacific region, from the East African coast to northern Australia and the East Asian

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islands. It grows in coastal areas in muddy and salty soils, forming dense thickets and sometimes forests along the shoreline. Grey mangroves have been used for centuries as medicinal plants. Their leaves, bark, roots, and fruits have been used in traditional medicine, especially in India and Southeast Asia, for a variety of ailments. Studies have also shown that leaves are a good source of dietary fiber, minerals, and vitamins and that fruits are a good source of dietary fiber and vitamins (Jain, Kaur, & Kaur, 2016). The leaves are believed to have antifungal, anti-inflammatory, and antiviral properties, while the bark has been used to treat skin diseases, wounds, and ulcers (Kumar, Mishra, & Mishra, 2013). The roots are believed to be effective in treating fever, stomachache, and dysentery, as well as in improving digestion and blood circulation. The fruits of the grey mangrove have also been used for their nutritional value, and to make jams, jellies, and tea. In recent years, the medicinal and nutritional value of the grey mangrove has been studied more extensively. Overall, the grey mangrove is a valuable plant, with a long history of medicinal and nutritional value. Its leaves, bark, roots, and fruits have been used for centuries to treat a variety of ailments, and also provide a good source of dietary fiber and minerals. In addition, the grey mangrove provides many other benefits to humans and the environment, making it an important species of mangrove. To protect the grey mangrove, governments and conservation organizations have put in place a variety of measures. Many countries have established protected areas where grey mangroves can be conserved, and have also implemented sustainable harvesting practices (McLachlan & McKee, 2010).

2. Geographical Location of Grey Mangrove

Pakistan is home to a number of mangrove forests located in coastal areas of the country. The mangroves are a vital part of the coastal ecosystem and provide a variety of ecological and economic benefits. In Pakistan, mangrove forests are found along the Indus River Delta in the south, along the coasts of the Arabian Sea and the Gulf of Oman, and along the coasts of the Balochistan and Sindh Provinces. The Indus River Delta is the largest mangrove ecosystem in Pakistan and is home to a number of species of mangroves. The Indus River Delta is located in the south of the country, extending from the border of India to the west of the Indus River near the port city of Karachi. This area is home to a variety of mangrove species, including *Avicennia marina*, *Rhizophora mucronata*, and *Ceriops decandra*. The coasts of the Arabian Sea and the Gulf of Oman are home to several species of mangroves. These include *Avicennia marina*, *Rhizophora mucronata*, and *Ceriops tagal*. The mangrove forests along the coasts of the Arabian Sea and the Gulf of Oman are located in the southern part of the country and extend from the border of India to the east of the Indus River near the port city of Gwadar. The mangrove forests along the coasts of Balochistan and Sindh Provinces are located in the southwestern part of the country and extend from the border of India to the west of the Indus River near the port city of Pasni. The Grey Mangrove, *Avicennia marina*, is a native to the coastal intertidal zones of the tropical and subtropical regions of the world. According to the International Union for Conservation of Nature (IUCN), the Grey Mangrove can be found in the Indo-West

Pacific region, including the eastern African coast (Giri, 2018). They are native to the Indian Ocean, Arabian Sea, parts of the Pacific Ocean, and the Red Sea, as well as to the tropical coastal regions of Australia, Africa, and South and Central America. Grey mangroves are typically found in tidal estuaries, where the water is brackish and the currents are relatively gentle. Additionally, they are often seen in areas of the intertidal zone where the water is highly saline, such as in salt marshes, mudflats and other coastal habitats. In Australia, grey mangroves are found along the east coast, from the north of Queensland to the south of New South Wales. They are also found in the coastal areas of the Northern Territory, as well as in Western Australia, from Shark Bay to Broome. In addition, they are also found in the coastal regions of South Australia and Tasmania. In Africa, grey mangroves are found in the tidal estuaries of many of the east and west coast countries, including Kenya, Tanzania, Mozambique, Angola, Namibia, South Africa, Ghana, Ivory Coast, and Senegal. They are also found in the Mediterranean Sea and the Red Sea, as well as in the Gulf of Guinea and the Gulf of Aden. In Central and South America, grey mangroves are found in the Caribbean Sea, the Gulf of Mexico, and the Pacific coast of Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru, Venezuela, and Brazil. In India and Southeast Asia, they are found in the coastal areas of the Arabian Sea, the Bay of Bengal, and the Andaman Sea. They are also found in the estuaries of Bangladesh, Thailand, Malaysia, Indonesia, and the Philippines (Ghisalberti, 2012). Grey mangroves have a wide distribution throughout the world and are an important part of many coastal ecosystems.

3. Introduction

Grey mangroves (*Avicennia marina*) are flowering plants belonging to the Acanthaceae family and are found in tropical and subtropical areas of the world. Native to the tropical and subtropical coasts of the Indian and Pacific Oceans, they are an important habitat for a large variety of marine and terrestrial wildlife (Tomlinson, 2006). They are salt-tolerant and are among the few plant species that can colonize and survive in saline environments (McKee, 2000). Grey mangroves are highly valued for their medicinal and nutritional properties. The leaves of the grey mangrove contain a variety of compounds, including flavonoids, terpenoids, polyphenols, and tannins. These compounds have been studied for their potential medicinal properties, such as antioxidant, anti-inflammatory, and antifungal activities. The fruits of the grey mangrove have also been used traditionally in traditional medicines for centuries, for the treatment of various ailments, including fever, pain, and inflammation. In addition to their medicinal properties, the leaves, bark, roots and fruits of the grey mangrove are also a good source of various essential nutrients, including proteins, carbohydrates, vitamins, and minerals (Gaviria, Correa, & Caceres, 2018; Lal, Kumar, & Singh, 2018). It is rich in dietary fibre, which is important for proper digestion, and also helps to lower cholesterol levels. The leaves of the mangrove are used as a fertilizer, and the bark is used for tanning leather. The roots are used to make charcoal and fuel, and the fruits are used for making jams, jellies, and tea. The grey mangrove also provides a

habitat for a variety of fish, birds, and other animals, and helps to protect the coast from erosion (Duke, 2006).

Grey mangroves are also important habitats for many species of animals, including shorebirds, crabs, and fish (Mumford, 2004). It is an important part of the mangrove ecosystem, providing habitat for a wide variety of wildlife, as well as acting as a buffer against coastal erosion (Rajan, Kumar, & Kumar, 2017). They also play an important role in coastal protection by reducing erosion, stabilizing shorelines, trapping sediment, and reducing wave energy (McKee, 2000). Therefore, the grey mangrove may be a valuable food source for people living in coastal areas where other sources of nutrition may be scarce.

4. Biochemical Composition of Grey Mangroves

The composition of grey mangroves is complex and highly varied, with a range of compounds present in their leaves, bark, and roots.

4.1 Leaves

Grey Mangroves (*Avicennia marina*) leaves are mainly composed of cellulose, hemicellulose, proteins, lipids, lignin, pectin, and tannins. Proteins and lipids together constitute about 20-30% of the dry matter. Lignin, pectin, and tannins are present in small amounts (Kang, Kim, & Kim, 2017; Prado, Mendonça, & Gomes, 2018)). Cellulose and hemicellulose are the main components, accounting for up to 50-58% of the dry matter (Zhou, Zhang, Zhang, & Jiao, 2018).

4.2 Bark

Grey mangroves (*Avicennia marina*) bark is composed primarily of lignin and cellulose, with lesser amounts of hemicellulose and extractives such as tannins (Rautenbach & Troskie, 2019). Other components found in grey mangrove bark include polyphenols, polysaccharides, proteins, and lipids (Wang et al., 2017). Grey mangrove bark also contains minerals such as calcium, magnesium, potassium, and silicon.

4.3 Roots

Grey Mangroves (*Avicennia marina*) are an important coastal species, known for their complex root systems and their ability to filter salt from seawater which is shown in Figure 01. These roots are highly adapted to the soil texture and contain several biochemical components. The main components of the root system are starch, proteins, lipids, and polysaccharides (Hissar, Akhter, Khan, & Islam, 2016). Starch is the most abundant component and is composed of glucose, fructose, and maltose (Ahmad, Idris, Salmah, & Mohd, 2018). Proteins are also present, such as albumin, globulin, and protease inhibitors. Lipids consist of waxes, triglycerides, and sterols (Lilley, Molloy, & Murray, 2020), while polysaccharides are composed of galactan, glucans, and xylans. These components are important for the Grey Mangroves' ability

to filter salt from the water, as well as their ability to tolerate a range of environmental conditions. Figure 02 shows that the roots also help to establish the flow of nutrient which ensures the optimal growth of mangrove plants.

The biochemical composition of grey mangroves is complex and highly varied, with proteins, carbohydrates, fats, and minerals present in their leaves, bark, and roots. The proteins present in the leaves, bark, and roots of grey mangroves are mainly composed of amino acids, with arginine, cysteine, glutamic acid, and glycine making up the majority of the total. The leaves, bark, and roots also contain high levels of carbohydrates, mainly in the form of starch and sugars such as glucose and fructose. Fats are also present in the leaves, bark, and roots, although in much lower concentrations than proteins or carbohydrates. These include triglycerides, free fatty acids, and sterols. Minerals such as calcium, magnesium, sodium, and potassium are also present in the leaves, bark, and roots of grey mangroves, although in much lower concentrations than the macronutrients.

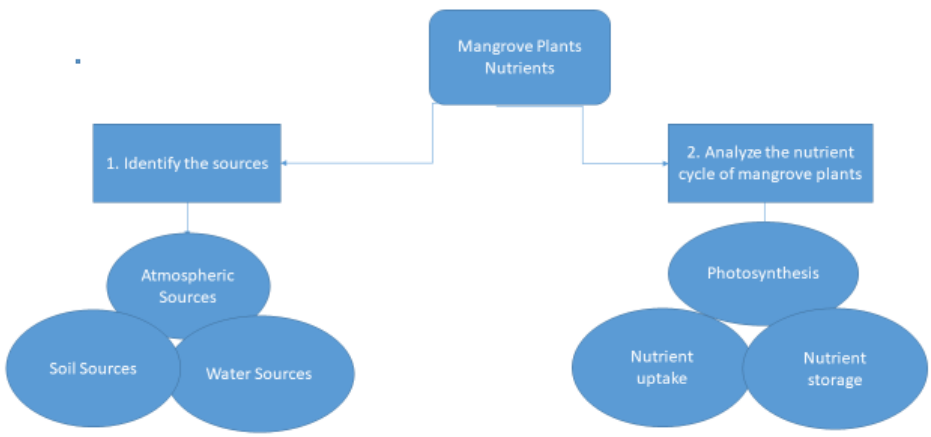

Figure 1. Identify and analyze the nutrients in mangrove grey plants

5. Nutrient and Mineral Content

Mangrove plants are often considered a source of beneficial minerals and nutrients for both humans and other organisms. Mangrove grey plants are also known for their highly nutritious content, containing a variety of essential nutrients and minerals such as proteins, carbohydrates, dietary fibre, and essential fatty acids. Studies have found that mangrove grey plants contain zinc, iron, calcium, magnesium, and other essential minerals. Additionally, mangrove grey plants have been found to contain a variety of essential amino acids, including valine, leucine, isoleucine, and phenylalanine (Khan, Kumar, & Rai, 2018). Furthermore, these nutrients and minerals

are important for human health and are often used in the production of nutraceuticals. Calcium and magnesium are essential minerals for healthy bones, teeth and organs, while potassium plays a role in muscle contraction, nerve transmission and digestion. Iron is important for the production of red blood cells and zinc is vital for the immune system and wound healing. In addition to minerals, grey mangrove plants are also a source of vitamins and other nutrients. The leaves contain vitamin E, which is known to be an antioxidant and can help to protect cells from damage caused by free radicals (Kannan & Murugan, 2018). Vitamin C and carotenoids are also present in the leaves, which can help to protect against disease, improve vision and support the immune system. The leaves also contain flavonoids, which have anti-inflammatory and anti-cancer properties (Vijayan & Hashim, 2016). Grey mangrove plants are also a source of dietary fibre, which is important for healthy digestion and can help to reduce cholesterol levels. They also contain essential fatty acids such as Omega-3, which are important for brain and heart health. Mangroves are also rich in proteins, which are essential for the growth and repair of cells, tissues, and organs. These plants have a special ability to analyze and monitor the nutrient content as per figure 01. Overall, grey mangrove plants are an important source of minerals, vitamins and other nutrients that are essential for human health. They are a valuable resource for coastal ecosystems and can provide a variety of services and benefits to both humans and other organisms.

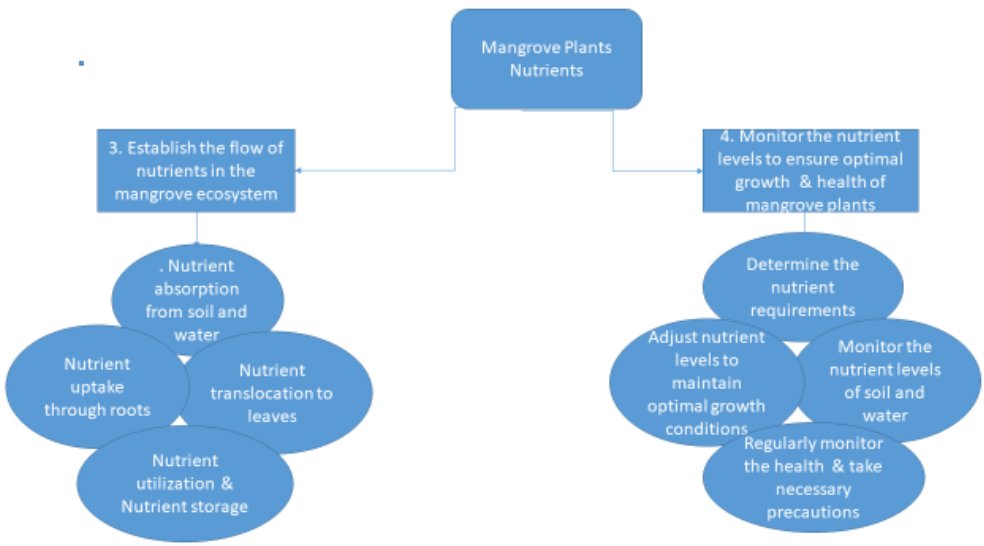

Figure 2. Establish and monitor the nutrient level of mangrove plants

6. Investigation of Traditional Uses of Mangrove Plants

Mangrove plants have been traditionally used around the world for a variety of applications. Mangrove plants have also been used as a source of nutrition. In Southeast Asia, mangrove plants have been used as a source of food for centuries, with the leaves and seeds being consumed (Hossain, Akhter, & Reza, 2016). In the Caribbean, mangrove fruits are used to make a type of alcoholic beverage called "mangrove toddy" (Mendoza, Torres, & Sánchez, 2019). In the South Pacific, mangrove plants are used to make a type of honey called "mangrove honey" (Mangubhai, Kumar, & Dutta, 2018). In India, mangrove plants have been used for their medicinal properties and as a source of fuel for cooking (Sasikumar, Selvaraj, & Sathishkumar, 2018). In addition to their traditional uses, mangrove plants have also been used to help protect coastal areas from erosion and storm surges (Reddy & Ramaswamy, 2015). Mangrove plants are also used to help filter and purify coastal water, reducing the impacts of pollution (Crooks, O'Rourke, Brehler, & Das, 2018). In the Philippines, mangrove plants have been used for centuries to create shelter and support local agriculture (Cruz & Silvestre, 2014). Mangrove plants also provide crucial habitats for a variety of species, including fish, birds, and other wildlife (Das, O'Rourke, & Crooks, 2017).

6.1 Management of Pain and Inflammation

Decoction of the bark and leaves of the grey mangrove is used to treat pain and inflammation. Poultice made from the bark and leaves of the grey mangrove is applied externally to reduce pain and inflammation. The leaves of the grey mangrove are boiled in water and the resulting decoction is consumed orally to reduce pain and inflammation. Powdered leaves of the grey mangrove are applied to the affected areas to reduce pain and inflammation. Infusion of the bark and leaves of the grey mangrove is taken orally to reduce pain and inflammation.

6.2. Boosting of the Immune System and General Health

Grey mangroves are traditionally used as a tonic to boost the immune system and general health. They are consumed as a tea or decoction to treat coughs, colds, and fever. Grey mangroves are used as a topical application to treat skin conditions such as eczema, psoriasis, and rashes. The leaves are crushed and applied to the affected areas to reduce inflammation and discomfort. Grey mangroves are used to treat digestive problems such as stomach cramps, gas, and indigestion. The leaves are boiled and consumed as a tea to reduce inflammation and improve digestion. Grey mangrove leaves are chewed and the juice is swallowed to treat sore throat, coughs, and other respiratory problems. The leaves are boiled and the steam is inhaled to treat sinusitis and other sinus-related issues. The leaves are boiled and the tea is consumed to treat nausea and vomiting. Grey mangroves are used to treat urinary tract infections and kidney stones.

6.3. Prevention of Infection

The leaves of the grey mangrove are used to treat skin infections and wounds. The bark of the tree is used to treat fever and to reduce inflammation. The leaves of grey mangrove are boiled and the water is used to treat sore throats and colds. The leaves and bark are used to make a tea that is used to treat stomach aches. The leaves are boiled and the water is used as a wash for ulcers, sores, and fungal infections. The bark is boiled and the water is used as a mouthwash to help prevent infection and promote healing. The leaves are boiled and the water is used as a wash for cuts and scrapes. The leaves are boiled and the water is used to help treat diarrhea.

6.4. Prevention of Cardiovascular Diseases

The bark of grey mangroves is used to make a decoction, which is consumed to reduce cholesterol and triglycerides in blood, and thus prevent cardiovascular diseases. The leaves and bark of grey mangroves are used to make a decoction, which is consumed to reduce blood pressure, and thus prevent cardiovascular diseases. The bark of grey mangroves is used to make a decoction, which is consumed to improve circulation and prevent formation of blood clots, and thus prevent cardiovascular diseases. Extract of grey mangroves is used to make a tonic, which is consumed to improve cardiac health and prevent cardiovascular diseases. The bark of grey mangroves is used to make a decoction, which is consumed to reduce inflammation, and thus prevent cardiovascular diseases.

6.5. Treatment of Respiratory Disorders

Boiling the leaves and bark of grey mangroves and inhaling the steam is used to treat respiratory ailments such as bronchitis, colds, and asthma. Drinking a decoction of the bark is used to treat fever and chest colds. The leaves of grey mangroves are boiled and the cooled liquid is used to treat sore throats. Pulverized leaves are applied externally on the chest to reduce coughing. Inhaling the smoke of burning grey mangrove leaves is believed to provide relief from coughing. The leaves are also used to treat bronchitis, sinusitis, and other respiratory disorders.

6.6. Treatment of Dental Problems

Grey mangroves are used as an anti-inflammatory agent for the treatment of dental problems. The leaves of grey mangroves are boiled and used as a mouthwash for gingivitis. The leaves of grey mangroves are chewed and used as a remedy for toothache. The bark of grey mangroves is boiled and used as an oral rinse for tooth decay. The extract of grey mangroves is used for the treatment of periodontal diseases. A paste made from the leaves of grey mangroves is used as a remedy for toothache.

6.7. Treatment of Eye Problems

Grey mangrove leaves can be used to treat eye problems such as conjunctivitis and blepharitis. A warm compress made from a decoction of grey mangrove leaves

can be applied to the affected area for relief. The leaves can also be boiled in water and the resulting liquid can be used to wash the affected area to reduce pain and inflammation. A paste made from the leaves can be applied around the eyes to reduce swelling and redness. The leaves can also be ground into a powder and mixed with honey to form a paste. This paste can be applied to the eyes to reduce irritation and inflammation.

6.8. Management of Diabetes

Boil the leaves of grey mangrove in water and drink the decoction to reduce blood sugar levels. Consume the infusion of leaves of grey mangrove to improve the body's insulin sensitivity. Prepare a paste of the leaves and apply it on the areas affected by diabetes. Consume the bark of grey mangrove to reduce the symptoms of diabetes. Consume the juice of grey mangrove leaves to reduce the symptoms of diabetes. Consume a mixture of the leaves and bark of grey mangrove to reduce blood sugar levels. Consume a mixture of the leaves and bark of grey mangrove to lower cholesterol levels. Boil the leaves of grey mangrove in water and drink the decoction to reduce oxidative stress. Consume a mixture of the leaves and bark of grey mangrove to regulate blood pressure. Consume the extract of grey mangrove leaves to reduce the risk of diabetic complications.

7. Conclusion

The medicinal and nutritional role of underutilized grey mangroves is an important and often overlooked aspect of their utilization. Grey mangroves have been historically used in Southeast Asia as a source of food, medicine, and building materials. In recent years, research has identified several compounds in the leaves, bark, and other parts of grey mangroves that have medicinal and nutritional properties. These compounds have been shown to have anti-inflammatory, anti-cancer, anti-diabetic, and anti-microbial properties. Furthermore, the leaves and bark of grey mangroves are rich in proteins, vitamins, and essential minerals. These findings suggest that grey mangroves could be a valuable source of nutrition and medicine in areas where access to these resources is limited or unavailable. The potential of grey mangroves as a source of nutrition and medicine has yet to be fully realized. More research is needed to better understand the biological activities of the compounds found in grey mangroves, as well as to investigate the potential health benefits of consuming their leaves and bark. Additionally, education and outreach programs should be developed to promote the utilization of grey mangroves as a source of nutrition and medicine. These initiatives should focus on increasing awareness among local communities, as well as guiding sustainable harvesting practices. In conclusion, grey mangroves are a valuable and underutilized resource with potential health benefits. Further research and education initiatives are needed to better understand and promote the medicinal and nutritional role of grey mangroves to ensure their sustainable use in the future.

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