

ENDANGERED MANGROVE VEGETATION OF *BARRINGTONIA RACEMOSA* REPORTED FROM POOVAR SOUTH COAST OF INDIA FOR CONSERVATION CONCERN

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Poovar is a popular tourist town in the Trivandrum district, Kerala state, west coast of India. This village has a beautiful sandy beach and bar-built estuary which attract tourists. The vegetation along the Poovar estuary has high degree of diversity and paleo-endemism. Anthropogenic intervention has fragmented vegetation of Poovar estuary and many species are under the threat of extinction. They are reduced to just one sq.km and restricted to isolated areas. *Barringtonia racemosa* is one of the threatened fresh water perennial small mangrove tree seen in the Poovar estuarine region. Extracts from this mangrove species have proven effective against human, animal and plant pathogens. The objective of present study is to initiate conservation strategies to protect the endangered endemic fresh water mangrove plant *Barringtonia racemosa* seen in Poovar estuary of south coast of India.

Key words: Poovar, Estuary, Mangrove, Conservation

Poovar is a small coastal village situated around 30 kms from Trivandrum, the capital city of Kerala and just 17 kms from Kovalam (International Tourist Destination) and 39 kms from Techno park city. Poovar is famous for its back waters, pristine beaches, beautiful estuaries and exotic resorts (Fig.1). The main attractions at Poovar are the backwaters mangroves, estuary, golden sand beach, and wide variety of birds. For

centuries, this ecosystem has been of great use and value to mankind. It helps in preventing soil erosion, floods and other natural calamities. Mangrove and estuaries are the breeding ground for many estuarine species and nursery ground for many marine species. Many birds also find their habitat in mangrove forests. During the beginning of the last century, Poovar had luxuriant growth of Mangrove forests. Today they are reduced and restricted to isolated areas. The reasons that have contributed to its decline are encroachment due to high population density on the coasts, commercial prawn farming, sand mining, dumping of wastes etc. The efforts for eco-restoration of mangroves are outdone by the ongoing process of converting the wetlands for construction of resorts, hotels and flats for eco tourism. Environmental activists continue to raise their concern that the wet lands and sensitive mangrove ecosystems will soon vanish if these fragile areas continue to be reclaimed in the name of development.

OBJECTIVE OF THE STUDY

The vegetation along the Poovar estuary has high degree of diversity and paleo-endemism. Anthropogenic intervention has fragmented vegetation of Poovar estuary and many species are under the threat of extinction. The literature shows that very little study was conducted in *Barringtonia racemosa* of Poovar coast. The present paper tries to adopt certain methods to conserve the endemic, endangered and threatened Mangrove plant *Barringtonia racemosa* of Poovar coast.

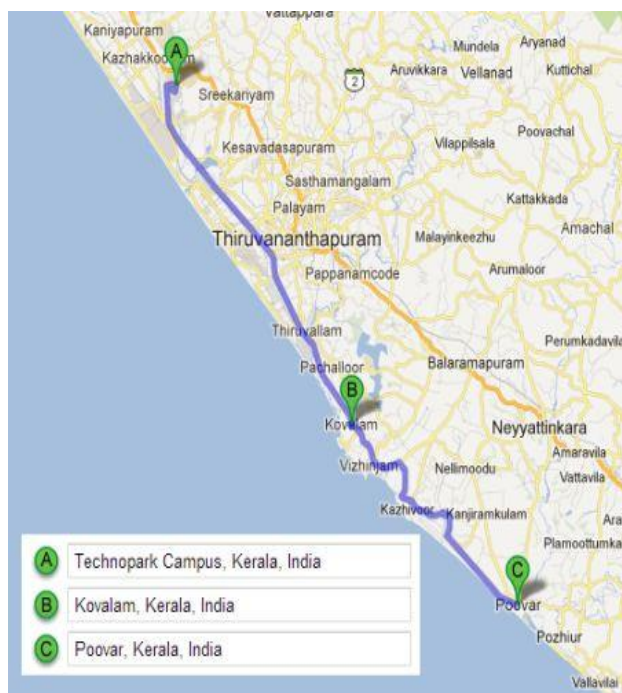


Fig:1

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HISTORY OF POOVAR AND ORIGIN OF NAME POOVAR:

During the Chola Dynasty's rule, Poovar was a port. Around 1000BC, Poovar became a trading hub for spices, timber, sandal wood and ivory. During the Travancore -Dutch war of 1741, a well trained army from Poovar backed the Travancore army by fighting against the Dutch East Indian Company and succeeded the war. Later

Marthanda Varma Maharaja was proclaimed the successor of the King, the two sons of the late King (Ettuveetil Pillamar) with the help of Madampis tried to usurp power. The Maharaja had to flee from his land as he had life threat from the Thampis and in the process landed up in Poovar. It was Moosa marikar, a rich and aristocratic businessman in Poovar, who gave asylum to the Maharaja. The business magnet of Poovar, Moosa Marikkar, also patronaged the Maharaja for his regaining power of his lost kingdom.

Among the fascinations the Raja experienced at Poovar during his shelter there was the site of red flowers, chipped out from the Kovala trees standing along the Neyyar riverbanks, floating in the river as a red carpet on water. The legend is that the stream was named as "POOVAR" as the Raja described the river as "POO-AAR" (meaning a stream of flowers) .The region was also known as Pokkumoosapuram. The beauty and

greenery of the picturesque and unparalleled silence of Poovar captured the mind of the Maharaja. Later the scientist found that the flower is belonging to a mangrove tree called *Barringtonia racemosa*.

DESCRIPTION OF BARRINGTONIA RACEMOSA:

Barringtonia racemosa, popularly known as Powder puff Mangrove tree is a fresh water perennial small mangrove tree(Fig.2). It is considered a mangrove associate occurring always near riverbanks, freshwater swamps, and occasionally in the less saline areas of mangrove swamps. The species cannot tolerate even light frost. It favours the wet tropical, moist topical and wet subtropical climatic zones.

It is easily recognized by its large leaves, delicate pinkish or white flowers (Fig.3) and guava-like fruit that hang in long racemes. It has a straight, unbranched stem that leads to a rounded crown and is usually 4-8 m tall, but occasionally reaches 15 m. The bark is grayish brown to pink with white blotches and raised dots and lines. The branches are marked with leaf scars. Alternately arranged leaves are clustered at the ends of branches. Leaves alternate, simple, crowded at the ends of the branches. They are obovate, 18-32 cm long, 5.5-14.5 cm broad, with leaf-stalks 0.5-1.2 cm long. The midribs are prominent on the lower side of the leaf and the branching



Fig:2



Fig:3

veins are visible on both sides. The leaves are deep green in the apex, broadly tapering, base narrow tapering, running into the petiole, margin entire, petiole very short without hairs. Showy flowers are produced on hanging racemes up to 1 m long. The buds are pinkish red and split open to bring forth masses of delicate stamens in pink to white sprays, up to 3.5 cm wide. The flowers give off a pungent, putrid yet faintly sweet odor in the morning. The fruit are quadrangular, 6.5 x 4 cm. Each fruit contains a single seed surrounded by spongy, fibrous flesh that provides the buoyancy that allows the fruit to be carried off with the tide. It is propagated through seed and cuttings. Powder puff Mangrove is globally distributed and it has been recorded in west coast of India, Sundarbans, Assam and Andaman Islands and often planted as ornamental (Strey, 1976).

IMPORTANCE OF REVIEW OF *BARRINGTONIA RACEMOSA* PLANT:

This review has revealed various medicinal properties appears to be widespread among mangrove plants, and thorough and systematic phytochemical and pharmacological studies are much needed to discover new antinociceptive, anti-inflammatory and antipyretic medicinal entities from mangrove plants like *Barringtonia racemosa*. The fruits of *Barringtonia racemosa* are prescribed in the ayurvedic literature of Indian traditional medicines for the treatment of pain, inflammation, ear ache, parturition and rheumatic conditions (Nadkarni, 1982). Apart from that, it has been reported that *B. racemosa* is medicinally used in the treatment of diarrhoea, asthma, coughs, jaundice, fever and functions as pain-killer as well. In Malaysia, the young shoots and leaves of *B. racemosa* are eaten raw as vegetable due to its medicinal values which is believed to be effective in high blood pressure treatment and management. The leaves are traditionally used to treat ulcer, itchiness, chicken pox and cancer as well. Apart from medicinal uses, *Barringtonia* species is used as firewood and for constructing planks in Sunderbans region in India. *B. racemosa* fibres are also used in producing hardboard, particle board and black board. *B. racemosa* is commonly known as fish poison tree, due its properties which are used to stun fish due to its poisonous saponin in seeds, bark, wood and roots. High content of tannin in barks is frequently used in powdered form for poisoning purposes.

In a study done by Khan *et al.* (2001), the roots of *B. racemosa*

are reported to have antibacterial activity against several strains of both gram positive and gram negative bacteria. Saha *et al.* (2013) conducted test on antibacterial activity from ethanolic bark extract. The ethanolic bark extract showed antibacterial activity against all bacterial strains tested with the zone of inhibition ranging from 6.96 to 14.12 mm. *B. racemosa* also reported to be a potential candidate for the development of phyto-based anti-tumour agent. Thomas *et al.* (2012) found that *B. racemosa*'s methanolic seed extract is used as anti-tumour agent. The optimum dose for anti-tumor activity was found to be 6 mg/kg whereby such dose protected all the animals challenged with the tumour cells. Shikha *et al.* (2010) studied the analgesic potential of *B. racemosa* fruits through acetic acid-induced writhing response and its antilipid peroxidation properties. Upon administration of *B. racemosa* ethanolic extracts at three doses of 125, 250 and 500 mg/kg body weight, the writhing responses in mice were successfully inhibited at 68.02%, 79.5% and 91.8% respectively.

The study of antioxidant activities done on this species was found to be documented by Behbahani *et al.* (2007), in which the samples were taken from the fully expanded leaf extracts. The results from the study showed a potent antioxidant activity found in *B. racemosa* in which the methanolic and ethanolic extracts in all aerial parts exhibited comparable activities to BHT (butylated hydroxytoluene), ascorbic acid and alphatocopherol. In addition to that, in a study done by Kong *et al.* (2012), water, ethanol, ethyl acetate and hexane were used as solvents for the extraction of antioxidant from leaves and stems of the shoots of *B. racemosa*. The ethanolic fruit extract of *B. racemosa* had been reported to have anti-inflammatory activities through carrageenan-induced paw oedema and formalin-induced paw oedema in experimental albino rats. *B. racemosa* fruit extract at 500 mg/kg body weight significantly inhibited the carrageenan-induced paw oedema at 75.00% inhibition, slightly less than the positive control (indomethacin) which produced 78.33% inhibition. Another anti-inflammatory activity had been further identified following a research done by Patil *et al.* (2011) in which the anti-arthritic potential of the species was being evaluated. Furthermore, this species may have the potential to be an immunosuppressive agent in addition to its anti-inflammatory activity due to suppression of secondary lesions in rats which is shown as a manifestation of cell-mediated immunity. *B. racemosa*

was reported to have alpha-glucosidase inhibitory activities. The antifungal activity of methanolic extracts of *Barringtonia racemosa* leaves, sticks and barks had been verified against *Fusarium* sp., *Trichoderma koningii*, *Penicillium* sp., *Ganoderma tropicum*, *Ganoderma lucidum*, *Aspergillus* sp. Apart from that, remarkable effects of antifungal activity were also identified in the boiling water extract of leaf against *Fusarium* sp. (51.72%) and the ethanolic extract of bark against *Rhizopus* sp. (37.50%). Among different fungi tested, *Fusarium* sp. was found to be more sensitive to *B. racemosa* extracts when compared to others (Hussin *et al.*, 2009).

The activity of *B. racemosa* against mycobacteria which is the causative factor of tuberculosis (TB) was evaluated by Mmushi *et al.*, (2010). *Mycobacterium smegmatis* was used in the study and the MIC (minimum inhibitory concentration) of leaf extracts towards the strain was evaluated. Roome (2011) studied the anti-arthritis properties of *B. racemosa* and found that the soft tissue swelling around the joints are cured by the ethanolic bark extract of *B. racemosa*. Saha *et al.* (2013) conducted a study to assess anti-diarrhoeal activity of *B. racemosa* in mice. He showed that the *B. racemosa* extracts exhibited significant reduction in the total number of faeces and prolongation of onset of diarrhea.

CONSERVATION AND RESTORATION OF THREATENED MANGROVE ECOSYSTEM OF POOVAR ESTUARY:

Restoration of an ecosystem is the act of bringing an ecosystem back to, as nearly as possible, its original condition (Field, 1999). Conservation strategies for mangroves should consider not only the plant but the ecosystem as a whole, including all the physical, chemical, and ecological processes that maintain productive mangroves. This is especially important in mangroves that do not receive external terrestrial nutrients from rivers or other sources (Sundararaman *et al.*, 2007).

Mangrove forest around the Poovar estuary has suffered from advanced degradation and over exploitation through human interactions over the last decades. The human-induced degradation such as land conversion for agricultural use and construction of resorts for eco-tourism made a big impact on the mangrove cover. It is necessary to give more attention to protect estuary from pollution. Important measures should be taken to control estuarine pollution through anthropogenic activities. The discharges from the sources should be pretreated

to avoid this pollution without directly flowed in to the aquatic systems (Divya and Mary Helen, 2017). The diverted use of freshwater for irrigation and land recovery has minimized the freshwater input that lead to rapid destruction of mangrove forest. Further, dam construction in the Neyyar River has also affected the freshwater inflow resulted in the destruction of *B. racemosa* plants. The establishment of nursery of coastal plants will help in such process of resilience to mitigate the effect of coastal disasters. Nursery approach is one of the best traditional methods of conserving mangroves. The establishment of nursery is essential in reforestation programs, provides good quality of seedlings at the right quantity in time. The application of panchakavya (blend of five products obtained from cow, namely cow dung, cow urine, cow milk, curd and ghee) are suitable for promoting plant growth and micro organisms. Introduction of biotechnological approach includes production of genetically improved trees, application of plant growth promoting microorganisms, propagation of mangroves by micro propagation or vegetative propagation or seed propagation will help in reforestation programme. Many of these methods should be taken for detailed research in the view toward future conservation and restoration of mangrove forest and it requires standardization for every mangrove species but it is not fully established. The ban should be imposed on reclamation of land for eco tourism activities. Strict vigilance has to be enforced by the Government to protect the plant from poaching for fire woods. The plant should be listed in the endangered plant category and necessary legal protection should be given.

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