STUDY OF THE EPIPHYTIC ALGAE FROM PNEUMATOPHORES OF AVICENNIA OFFICINALIS L

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ABSTRACT

Kerala supports many wetlands of International and National importance. These supports rich mangroves along the coastal zones . Kannur district of Kerala support about 14 speciesof true mangroves ,of which *Avicennia officinalis* was of maximum occurrence . *Avicennia officinalis* has a wide geographical distribution with wide numbers found in inter tidal estuaries along many of the worlds tropical and warm temperate coasts. Members of *Avicennia* have pneumatophores ,that project above the mud to facilitate gas exchange for the submerged primary root. The exposed part contain large number of small openings, exposed in air. The water inundated portion and freely exposed portion support rich amount of algae. The present study was carried out in the Kunjimangalam and Valapattanam wetlands of Kannur districts of Kerala during the period of November to March 2019. Quadrant of size 25x25cm^2 where sampled at different locations of the selected two sites mentioned above randomly. The pneumatophores of *Avicennia* have been found to support a rich flora of algae and other micro organisms. 15 species of algae belongs to various classes isolated The biomass of algae on pneumatophores were entirely different in the two sites. The comparison of pneumatophore density at the two sites indicate that, Kunchimangalam region have favorable condition for the abundant growth of pneumatophore, supports high density of algae while compared to the most polluted Valapatanam site. This study signifies the role of mangroves in supporting rich biodiversity and the presence of algae also help to add the carbon sequestering power of mangroves.

INDEX TERMS – Mangrove, Pneumatophore.

1. INTRODUCTION

Wetland system directly or indirectly support thousands of people providing goods and services to them. However urbanization, development activities and mushrooming of residential complexes have fragmented the continuity of the wetland and destroyed its vegetation. Though there were no quantitative estimate on the rate of destruction of wetland in Kerala, the qualitative degradation of ecosystem is more or less, well understood. The major issue facing the wetlands are mainly related to pollution, eutrophication, encroachment, reclamation, mining and biodiversity loss. Algae are diverse water plants that can vary in size, colour, and shape. The unique wetland ecosystem of Kerala include marshy and water logged areas ,vast areas associated with back waters , lakes and the *Myristica* swamps in the western Ghats . Kerala contain a few wetlands of International or National importance. The wetlands of Kerala especially those in Kannur District support rich diversity of Mangroves. Radhakrishnan, et al (2006) reported the presence of about 172 birds, 110 fishes, 13 mammals and several invertebrates from the mangroves of Kannur district, Chemballikund wetland in the Kunhimangalam Grama panchayat characterized by large stretch of mangrove.

Of the reported 14 species, *Avicennia* was abundant and significant. Avicennia has a wide geographical distribution with wide numbers found in inter tidal estuaries along many of the worlds tropical and warm temperate coasts. Members of *Avicennia* have pneumatophores (respiratory roots), that project above the mud to facilitate gas exchange for the submerged primary root. The exposed part contain large number of

small openings, expose in air. The water inundated portion and freely exposed portion support rich amount of algae. Most of them are epiphytic forms. These structures were so significant as they were rich in Microscopic and macroscopic biodiversity. It also ensures the primary production in the particular ecosystem. Algae were also considered as ecological indicators. Saifullah et al.(2007) conducted studies on epiphytic organisms on pneumatophores of the mangrove Avicennia marina, its occurrence and their possible functions. In their studies nature of epiphytism of red algae, the occurrence and possible role of other epiphytic microorganism within the superficial tissues of pnematophore of *Avicennia marina* were conducted. The present study is an attempt to elucidate the epiphytic algal forms of Pneumatophores and also comparative study from two different environmental conditions.

2. MATERIALS AND METHODS

The present study was carried out in the Kunjimangalam and Valapattanam wetlands of Kannur district of Kerala during the period of November to March -2018. Although many species of mangroves have to be reported to occur in this region, we focused on the *Avicennia officinalis* This study was mainly concentrated on the two location among which one is highly conserved and other is polluted with city's immense industrial and municipal waste. Kunjimangalam was located at 12 degree 15' North and 75 degree 30' East, Kunjimangalam mangrove forest occur at the confluence of Perumba river and Kavvayi Estuary. This place is known as 'Kandal gramam' meaning 'Mangrove village' as the area has luxuriant growth of mangroves. Total extend of the area is about 5km sq. The area harbors 13 true mangrove species. Valapattanam is a small town in the Kannur district, located in Kannur Kerala. The area is 2.04sqkm .Valapattanam is located at 11.9degree N 75.37degree E .average elevation is 6 meter. Quadrant of size of 25x25cm^2 where sampled at different location of the selected two sites mentioned above randomly. Length and breadth of each pneumatophore is measured and by that surface area of pneumatophores is calculated. The pneumatophore density were calculated by using another formula .

Density of pneumatophores = total number of pneumatophores / number of quadrants

The pneumatophores of *Avicennia* species from the above location were bring it into the laboratory. The surface algae of pneumatophore were taken, the mud is removed without disrupting algae. The algae were mounted by using glycerine and slides were prepared. It was examined under research binocular microscope and identifications were done by "An Illustrated Algal Flora of Kerala "By Jose John And M.S. Francis. Epiphytic biomass was measured in terms of length and breadth of algal mass surrounding the pneumatophores and also as dry weight. The collected epiphytic algae then placed in an oven and left to dry at 80^{0}c for a constant dry weight for one day.

Dry weight in cm^2= Average weight of algae / Surface area of pneumatophores

Average dry weight = dry weight per pneumatophores × number of pneumatophore

3. RESULTS AND DISCUSSION

The pneumatophores of mangrove have been found to support a rich flora of algae and other micro organism. The biomass of algae on pneumatophores of mangrove entirely varies in the two location that we selected. Kunjimangalam is one of the mangrove conservation centre in Kerala, on the other hand Valapattanam is highly polluted with cities immense waste and municipal waste. The average pneumatophore density of Valapattanam was found to be 4 where as the average pneumatophores density of Kunjimangalam is 11.75.The large difference in average density of pneumatophores in the two location indicate extremity of conditions, that favour for the growth and development of pneumatophores. There is also a considerable variations in the epiphytic biomass of algae on pneumatophores. Ephiphytic biomass was measured in terms of breadth and length of algal mass surrounding the pneumatophores were given below in the table-1.

Table -1-Average Length And Breadth Of Pneumatophore At Kunhimangalam

kunjimangalam	length(cm)	breadth(cm)
quadrant 1	15.46	2.088
quadrant 2	19.46	1.98
quadrant 3	24.55	1.85
quadrant 4	23.45	1.95
quadrant 5	24.38	2.30
quadrant 6	28.7	2.24
quadrant 7	18.22	2.02
quadrant 8	19.27	2.12

Average length of pneumatophore =21.68 cm
Average breadth of pneumatophore =2.073 cm

Table -2- Average Length And Breadth Of Epiphytic Mass On Pneumatophore At Valapatanam

VALAPATTANAM	LENGTH(cm)	BREADTH(cm)
Quadrant 1	23.62	2.18
Quadrant 2	17.7	1.9
Quadrant 3	13.82	1.65
Quadrant 4	15.6	1.72
Quadrant 5	20.1	1.95
Quadrant 6	14.6	1.7
Quadrant 7	18.8	1.93
Quadrant 8	12.75	1.6

At Kunhimangalam region pneumatophores have an average length of 21.68cm and breadth of 2.073cm. . In Valapattanam the average length of pnematophore is 18.38cm and average breadth of pneumatophores is 1.91cm.

By calculating the fresh weight of algae there was a considerable variation in these regions. It was also observed in dry weight of the epiphytic mass of algae on the pneumatophores. The studies fairly indicate that the Kunjimangalam habitat that provide favourable condition for the algal growth on pneumatophores.

The algal growth on pneumatophores was because of the favourable conditions as follows

- Average temperature of mangrove habitat that support the growth of epiphytic organism on pneumatophore
- Average pH of mangrove habitat support epiphytism on pneumatophores .
- Mangroves are salt loving species and salinity favour the pneumatophores growth and epiphytism
- Pnematophore produce exudates which provide suitable medium and nutrients for the epiphytic organism.

In Valapattanam region algal biomass found on pnematophore is comparatively less than that of Kunjimangalam. It is mainly due to the increased rate of pollution. Valapattanam is highly polluted with cities immense waste and municipal waste also. Increasing rate of industrialization and increased population is also a major reason for the pollution and which effect epiphytism on pneumatophores. There is no conservation project to protect these highly productive area as like kunjimangalam. The major group algae found on these two region is from the group Chlorophyceae (Table -3,4).

Table -3- List of algae found on pneumatophores of *Avicennia* at Valapattanam

ALGAE	CLASS
Ulothrix	Chlorophyceae
Enteromorpha	Chlorophyceae
Cladophora	Chlorophyceae
Oedogonium	Chlorophyceae
Pinnularia	Bacillariophyceae
Novicula sps.	Bacillariophyceae
Hormidium	chlorophyceae
Microspora irregularis	chlorophyceae
Lyngbya	Cyanophyceae

From the studies done at Valapattanam and Kunjimangalam ,we concluded that the algae work as indicator of pollution. The high biomass of algae indicate low pollution and vice versa. The present work is a pioneer work regarding the determination of epiphytic algal biomass on the true mangrove species *Avicennia officinalis***.** As pneumatophores play a very important role in gas exchange in the stressed halophytic conditions. The two study area selected were compared for the total epiphytic algal biomass and it was found that the pneumatophores of Kunchimangalam mangrove conservation site supports diverse algal flora and density as compared to the highly polluted fragile wetlands of Valapatanam. Some of the algal

Table -4 -The algae found on pneumatophores of*Avicennia* at kunjimangalam

ALGAE	CLASS
Oedogonium	Chlorophyceae
Cladophora	Chlorophyceae
Ulothrix	Chlorophyceae
Enteromorpha	Chlorophyceae
Temnogamatum tirupatiense iyengar	Chlorophyceae
Pinnularia	Bacillariophyceae
Nostoc	Cyanophyceae
Microspora irregularis	Chlorophyceae
Microspora irregularis	Chlorophyceae
Ankistrodesmus	Chlorophyceae
Artherospira massarti	Cyanophyceae
oscillatoria	Cyanophyceae

species found in Valapatanam were absent in Kunchimangalam, indicates their adaptability to the extreme polluted condition. Most of the pneumatophores were degraded or pores were closed or covered with plastics and other pollutants. As this fragile system supports diverse algal mass , there need an urgent conservation strategy to protect this biodiversity rich ecosystem. More detailed seasonal study required to analyse the algal flora on the pneumatophores, because they were the primary producers of the system.

4. REFERENCES

Jose john & Francis, M.S. (2013) An illustrated algal flora of Kerala. Vol .1;Idukki district.

Radhakrishnan, C., K.C. Gopi, & M.J. Palot (2006). Mangroves and their faunal associates in Kerala with special reference to Northern Kerala, India. *Records of the zoological Survey oIndia, Occasional Paper* 246:1–81.

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Saifulla, S.M & Waqar Ahmed (2007). Epiphytic Algal Biomass On Pneumatophores Of Mangroves Of Karachi, Indus Delta. Pakisthan Journal of Botany. 39(6): 2097-2102.