



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>
Journal DOI: [10.21474/IJAR01](https://doi.org/10.21474/IJAR01)

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

Cyanobacterial Biodiversity at Marine environment from Thondiyakadu, Thiruvarur District, South East Coast of India.

T. Bhuvaneshwari, and A.Muruganandam.

PG and Research, Department of Botany, M.R.Govt. Arts College, Mannargudi, Thiruvarur District, TamilNadu.

Manuscript Info

Manuscript History:

Received: 12 February 2016
Final Accepted: 25 March 2016
Published Online: April 2016

Key words:

Estuary, Marine Cyanobacteria,
Physico-chemical parameters.

*Corresponding Author

T. Bhuvaneshwari.

Abstract

India is one of the mega biodiversity country in the World, having almost all possible kind of climatic variations with a great diversity of microbes especially the Cyanobacteria. Marine Cyanobacteria were isolated from water samples of Thondiyakadu coast and Valavanaru estuary located at Muthupet Mangrove environment, south east coast of India. Totally thirty five marine Cyanobacteria were isolated by spread plate method of ASN III agar medium. Physico chemical parameters of the water samples were analysed. The maximum number of Cyanobacterial species in both of site areas such as *Osillatoria acuminata*, *O.animalis*, *O.brevis*, *O.formosa*, *O.okemi*, *O.limosa*, *O.limetica*, *O.rubescens*, *O.saline*, *O. subbrevis*, *Lynbya confervoides*, *L.majuscula* and *L.putealise*, were recorded.

Copy Right, IJAR, 2016.. All rights reserved.

Introduction:-

Cyanobacteria are a remarkable group of simple Photosynthetic microorganism with worldwide distribution. Cyanobacteria are single celled organisms that live in fresh, brackish, and marine water. Taxonomic studies on the Cyanophyceae are very scarce. They are important primary producer, and without them no animal populations including fishes could exist in natural waters (Post, 1999). They are also called the Blue green algae and widely distributed in natural ecosystems, such as land, soil, fresh water, oceans, estuarine lakes, salt marshes and also in hyper saline salt pans (Fogg *et.al.*1973) Studies on concentrating essentially on cyanobacteria had been very limited (Thajuddin and Subramaniyan, 1990 ; Thajuddin, 1991; Selvakumar and Sundararaman, 2001; Sakthivel, 2004; Sudha *et al.*, 2007) Ecobiology of natural marine cyanobacterial population in the gulf of mannar region of the Indian coast (Thajuddin and Subramanian, 1990; Thajuddin 1991). They are one of the important coast resources and constitute integrals and major component of the microbiota in Coastal Stream and estuarine environment. (Selvakumar and Sundararaman 2001; Abed *et al* 2002; Geiss *et al.*, 2004, Sudha *et al.*, 2007;) However, the Cyanobacterial population of Thondiyakadu coast in relation to the environmental characters in not explored properly. In the present investigation was aimed to study diversity of marine Cyanobacteria in Thondiyakadu coast in south east coast of India.

Materials and Methods:-

Study Area:-

The sites were selected in the study of Thondiyakadu coast and Valavanaru Estuary of Muthupet mangroves, Thiruvarur District, TamilNadu, south east coast of India. For the present study, a specific area were identified namely Thondiyakadu. Thondiyakadu is located in Muthupet at Thiruvarur District. It is situated latitude: 10.4° N and longitude:79.5°E. It is about 15 km of the Muthupet Mangrove. The rivers of Keelaithankiyar, Marakakoriyar, Valavanaru and other tributaries of the river cauvery flow through the Thondiyakadu and adjacent villages.

Sample collection, isolation and identification:-

The water samples were collected in a sterilized glass bottle and were transported in to the laboratory immediately. The collected water samples were concentrated by centrifuged at 4000 rpm for 10 minutes. To the sample, one drop

of lugol's iodine solution was added for cell counts by using microscope. A small quantity of the concentrated samples were analyzed for the dominant cyanobacterial group based on the colour of the thallus, unicell, colony formation, arrangements of trichome and presence or absence of mucilaginous sheath under the 100 and 400 x objectives of light microscope (Desikachary, 1959.)

Biodiversity of Cyanobacteria from water samples were collected with stations. Specimens were collected in polythene bags and plastic via's and were later transferred to Erlenmyer flask containing sea water and ASN-III medium (Rippka et.al, 1979). Standard microbiological methods were followed for isolation of cyanobacteria. Algal samples were microscopically examined and plated on solid ASN – III agar medium.

Composition of ASN-III Medium (g/L)

MgCl ₂ .6H ₂ O	2.000
KCl	0.500
NaNO ₃	0.750
K ₂ HPO ₄ .3H ₂ O	0.020
MgSO ₄ .7H ₂ O	3.500
CaCl ₂ .2H ₂ O	0.500
Citric acid	0.003
Ferric ammonium citrate -	0.003
EDTA (disodium salt)	0.0005
Na ₂ CO ₃ -	0.020
Sea water	1000ml
Trace metal mix A ₅ to C* -	1 ml
pH	7.5

*Trace metal mix A₅ + Co contains (g.l⁻¹)

H ₃ BO ₃	2.860
MnCl ₂ .4H ₂ O	1.810
ZnSO ₄ .2H ₂ O	0.222
Na ₂ MoO ₄ .2H ₂ O -	0.390
CuSO ₄ .5H ₂ O	0.079
Co(NO ₃).6H ₂ O	0.0494

Plates were incubated at controlled conditions (temperature was maintained at 28 ± 2°C fitted with cool white fluorescent tube emitting 2500 lux for 12 hrs a day). Cyanobacterial identification was done with manuals (Desikachary, 1959 and Humm and Wick, 1980).

Analysis of physico-chemical parameters (APHA, 1998):-

The physico chemical parameters like salinity, pH, atmospheric temperature, water temperature, nitrate, phosphate were estimated by standard method.

Results and Discussion:-

In the present investigation suggests that the Thodiyankadu coast and Valavanaru estuary were analyzed. According to the parameters of Rainfall (305.7 mm), atmospheric temperature (29°C), water temperature (30°C), pH(7.5), salinity (36%), dissolved oxygen (4.4 ml/l), nitrates (8.8 g/l) and phosphate (4.6 g/l) were represented in the Thodiyankadu coastal areas respectively. Whereas in the sites of Valavanaru estuary also estimated such as, with rainfall (305.7 mm), atmospheric temperature (27°C), water temperature (31°C), pH (6.4), salinity (34%), dissolved oxygen (4.1 ml/l), nitrate (8.2g/l) and phosphate (3.8g/l) were represented respectively. The cyanobacterial wealth in different environment around the world in general and marine environments in particular (Kristiansen, 1972; Gonzalez and parra, 1975; potts, 1980; Anand, 1982; Anand et.al 1986; santra et.al 1988; Palaniselvam, 1995, 1998; Kathiresan and Bingham 2001. Most marine forms grow along the shore benthic vegetation in the zone between high and low tided marks. (Humm and Wicks, 1980; Ramachandran, 1982; Thajuddin, 1991b; Thajuddin and Subramanian, 2002;).

However the diversity cyanobacteria of Thondiyakadu is not explored properly. The present investigation suggests that the environmental parameters of cyanobacteria can be estimated. An attempt has also been made to delineate the subtle relationship between cyanobacteria and the environmental conditions within the marine ecosystem and estuary of Valavanaru and Thondiyakadu coast, South east coast of India.

Table – 1 Physico-chemical parameters of estuary and marine environment of Thondiyakadu, south east coast of India.

Physico – Chemical Parameters	Station – I (Valavanaru estuary)	Station – II (Thondiyakadu coast)
Rainfall	305.7	305.7
Atmosphere Temperature	29	29
Water Temperature	31	30
pH	6.4	7.5
Salinity (%)	34	36
Dissolved oxygen (ml/L)	4.1	4.4
Nitrate (g/L)	8.2	8.0
Phosphate (g/L)	3.8	4.6

Non – heterocystous forms dominate in the saline environment and this finding is in accordance with many other workers (Thajuddin and Subramanian, 1992; Palaniselvam, 1998). Desikachary (1959) suggested that probably 20% of all known cyanobacteria occur in saline conditions and majority of them are truly marine (Thajuddin and Subramanian, 2002; Thajuddin and Subramanian, 1991a; Nagarkat et.al., 2000). However, it is difficult to strictly segregate most of the cyanobacteria into marine and freshwater species can be done with other algal forms (Subramanian and Thajuddin, 1995). Thajuddin and Subramanian (1992) observed that 75 of the species recorded from the southern east coast of India originally have been reported from freshwater sources by earlier workers (Biswas, 1979; Smith, 1950; Desikachary, 1959; Tilden, 1968; Humm and Wicks, 1980).

Cyanobacteria are ubiquitous in nature. In the present investigation that the diversified ecosystem of coastal and estuary variable cyanobacterial diversity. The optimum level of light water, temperature, humidity and nutrient availability that are providing a favourable environment for the luxuriant growth of cyanobacteria. Morphologically different cyanobacterial isolates were recorded. The both samples possess more than 35 morphologically different cyanobacterial species represented. Morphological identification of cyanobacteria showed both filamentous and unicellular growth formation was observed.

Thirty five Cyanobacterial species have been recorded in the present Investigation (Table-2). Which belongs to 9 families. Among the families maximum was recorded in Oscillatoriaceae (14) Species. The species such as *Oscillatoria acuminata*, *O. animalis*, *O. brevis*, *O. formosa*, *O. okemi*, *O. limosa*, *O. limetica*, *O. rubescens*, *O. saline*, *O. subbrevis*, *Lynbya confervoides*, *L. majuscula*, *L. putealise*, and minimum in Chroococaceae and Scytonemataceae was recorded only one species of *Chroococcus minor* and *Plectonema radiosum*.

Table 2 Diversity of Marine Cyanobacteria from Marine And Estuary of Thondiyakadu Coast, South East Coast of India

Name of the species of cyanobacteria	Thondiyakadu	Valavanaru
Chroococcaceae		
<i>Chroococcus minor</i> (Kutz) Nag.	-	+
Merismopediaceae		
<i>Aphanocapsa littoralis</i> . Hansging	-	+
<i>Aphanocapsa hiformis</i> A.Br.	-	+
<i>Syneocystis pevalekii</i> Ercegovic	+	-
<i>Synechococcus cedrorum</i> Sauvagean	+	+
Microcytaeae		
<i>Gloeocapsa calcarea</i> Tilden	-	+
<i>G. Compacta</i> Kutz	+	+
<i>Microcystis robusta</i> (Clark) Nyagaard	-	+
<i>M. Pretecystis</i> Crow	-	+
<i>M. Aeruginosa</i>	+	-
Nostocaceae		
<i>Anabaeba spiroids</i> Klebahn	-	+
<i>A. Orientalis</i> Dixit	+	+
<i>Nostoc picinale</i> ex Born. flash	-	+
Oscillatoriaceae		
<i>Oscillatoria salina</i> Biswas	-	+
<i>O.formosa</i> – Bory ex. Gomont	+	-
<i>O.subbrevis</i> Schemidle	+	+
<i>O. limetica</i> lemn	-	+
<i>O. animalis</i> agex Gomont	+	+
<i>O.Brevis</i> (Kutz),Gomont	-	+
<i>O. Rubescens</i> (Kutz),Gomont	+	+
<i>O. Okeni</i> Ag. ex. Gomont	-	+
<i>O.limosa</i> Ag. Ex. Gomont	-	+
<i>O. acuminata</i> Gomont	-	+
<i>O.perornata</i> skuja		
<i>L. Confervoides</i> C.Af.ex Gomont	+	+
<i>L.Putealise</i> Liebm ex Gomot	+	-
<i>L.majuscula</i> Hayvey ex Gomot	-	+
Phormidiaceae		
<i>P.ambiguum</i> Gomont	-	+
<i>P. Uncinatum</i> (Ag) Gomont	-	+
<i>P. anomala</i> Rao, C.B.	-	+
Pseudanabaenaceae		
<i>Spirulina subsala</i> Oerst. Gomont	-	+
<i>S. Maxima</i>	-	+
Rivulaiaceae		
<i>Calothrix contarenii</i> (zanard) Bornet et flahault	+	-
<i>Calorthrix ghosei</i> Bharadhiraja	-	+
Scyponemataceae		
<i>Plectonema radiosum</i> Bornet ex Gomont	-	+

Acknowledgement:-

The authors are thankful to Dr. A. Muruganandam, PG and Research Department of Botany, M.R.Govt. Arts College, Mannargudi.

References:-

1. Abed, R.M., Safi, N.M., Koster, J., De Beer, D., El-Nahhal, Y., Rullkotter, J. and Garcia-Pichel, F., 2002. Microbial diversity of a heavily polluted microbial mat and its community changes with degradation of petroleum compounds, *Appl. Environ. Microbiol.*, 68(4) : 1674 – 1683.
2. Anand, N., 1982. Studies on marine blue-green algae, *Indian Sci. Cong. Assoc. 69th Session, Mysore (Abstract)*.
3. Anand, N. and Venkatesan, N., 1985. Note on blue-green algae from salt pans, *Seaweed Res. Utilin.*, 7(2) :101-103.
4. Biswas, K., 1949. Common Fresh Water and Brackish Water Algal Flora of India and Burma (Part I & II). Records of the Botanical Survey of India, Manager of Publications, New Delhi.
5. Bloom Forming Marine Cyanobacterium *Trichodesmium*. In : Sahoo, D. and P.C. Pandey, (Eds.), *Advances in Marine and Antarctic Sciences APH Publishing co, New Delhi*, pp : 57-89.
6. Cyanophyceae. Hafner Publishing co., New York, pp : 48-99.
7. Desikachary, T.V., 1959. Cyanophyta. Indian Council of Agricultural Research, New Delhi. pp : 686.
8. Fogg, G.E., 1973. Physiology and ecology of marine blue-green algae. In the *Blue-green Algae* (Carr, N.G. and Whitton, B.A. (eds.)), Academic Press, London.
9. Geiss, U., Selig, U., Schumann, R., Steinbruch, R., Bastrop, R., Hagemann, M. and Schoor, A., 2004. Investigations on cyanobacterial diversity in a shallow estuary (Southern Baltic Sea) including genes relevant to salinity resistance and iron starvation acclimation, *Environ. Microbiol.*, 6(4) : 377-387.
10. Gonzalez, M. and Parra, O.O., 1975. Marine Blue-green algae of Chile. 1. Blue green algae of the intertidal zone of Bay of Concepcion, *Gayana Bot.*, 31: 3-64.
11. Humm, J. and R. Wicks, 1980. *Introduction and Guide to the Marine Blue-Green Algae*. A. Wiley Interscience Publication, New York, pp : 1 – 273.
12. Kathiresan, K. and B.L. Bingham, 2001. Biology of Mangroves and mangrove ecosystems. *Adv. mar. Biol.*, 40 : 81 –251.
13. Kristiansen, A., 1972. A Seasonal study of marine algal vegetation in Tuborg Harbour, the South Denmark, *Bot. Tidsskr.*, 67: 201-204.
14. Nagarkar, S., Subramanian, G. and Thajuddin, N., 2000. Marine cyanobacterial biodiversity from Andaman Islands, India. 4th Asia – Pacific conference on Algal Biotechnology, University of Hong Kong, Hong Kong.
15. Nair, V.S., Devassy, V.P. and Qasim, S.Z., 1980. Zooplankton and *Trichodesmium* phenomenon, *Indian J. Mar. Sci.*, 9 : 1-6.
16. Post, A.F., 1999, The Prochlorophytes – An algal Enigma: Biology of chlorophylla, Containing Photosynthetic Prokaryotes. In: Seckback, J (Ed.), *Enigmatic Microorganisms and Life in Extreme Environment*. Kluwer Academic Publ. Dordrecht, Netherlands, pp:115-125.
17. Potts, M., 1980. Blue-green algae (Cyanophyta) in marine coastal environments of the Sinai Peninsula distribution, zonation, Stratification and taxonomic diversity, *Phycologia*, 19:60-73.
18. Palaniselvam, V., 1995. Studies on the Cyanobacterium *Phormidium tenue* (Menegh.) Gornont for its utility in aquaculture shrimp feed and as bio fertilizer for mangroves. M.Phil. Thesis. Annamalai University, India, pp : 45.
19. Ramachandran, S., 1982. Studies on blue green algae from Porto Novo (Lat.11°30' N; Long. 79°50'E) marine environments, Ph.D., Thesis, Annamalai University, Annamalai Nagar, Tamilnadu, India.
20. Ramamurthy, V.D., 1968. Studies on phytoplankton in Porto Novo waters with reference to *Trichodesmium erythraeum* (Her.) Ph.D. Thesis, Annamalai University, Annamalai Nagar, Tamil Nadu, India.
21. Rippka, R., Deruelles, J. Waterbury, J.B., Herdman, M. and Stainer, R.Y., 1979. Genetic assignments, strain histories and properties pure culture of cyanobacteria, *J. Gen. Microbiol.*, 1111 : 1- 61.

22. Rippka, R., J. Deruelles, J.B. Waterbury, H. Herdman and S.Y. Stainer, 1979. Generic assignments, strain histories and properties of pure culture of cyanobacteria., *J.Gen. Microbiol.*, 1111: 1-61.
23. Selvakumar, G. and Sundararaman, M., 2001. Mangrove associated cyanobacterial species in Muthupet estuary, *Seaweed Res. Utilizn.*, 23(1-2) : 19-22.
24. Selvakumar, G. and Sundararaman, M., 2007. Diversity of cyanobacterial flora in the backwaters of Palk Bay region, *Seaweed Res. Utiln.*, 29(1-2) : 139-144.
25. Smith, G.M., 1950. The Fresh Water Algae of United States. Cyanophyceae Mc-Graw Hill Book company, New York : 539 –604.
26. Strickland, J.D.H. and Parsons, T.R., 1972. A Practical hand book of seawater analysis, Bull. 67, Fish. Res. Bd. Canada, pp.311.
27. Subramanian, G. and Thajuddin, N., 1995. Ecobiology of Marine cyanobacteria. *Advances in Ecology and Environmental Science*; 189-212.
28. Subramaniyan, G. and N. Thajuddin, 1995. Ecobiology of Marine Cyanobacteria. In : Mishra, P.C., N. Basher, B.K. Senapathi and B.C. Guru. (Eds.,) *Advances in Ecology and enviornmental Sciences Ashish Publishing House*. 8/81. Punjabi Bagh, New Delhi.
29. Sudha, S.S., Panneerselvam, A. and Thajuddin, N., 2007. Seasonal variation of cyanobacteria at Muthupet mangrove environs, Tamil Nadu, South India, *Seaweed Res. Utiln*, 29(1-2) : 263-271.
30. Sakthivel, K., 2004. Studies on marine cyanobacteria from mangrove environment, Ph.D. Thesis, Annamalai University, Tamilnadu, India.
31. Santra, S.C., Pal, U.C., Maity, H. and Bandyopadhyaya, G., 1988. Blue-green algae in saline habitats of West Bengal. A systematic account, *Biol. Mem.*, 14:81-108.
32. Selvakumar, G. and Sundararaman, M., 2001. Mangrove associated cyanobacterial species in Muthupet estuary, *Seaweed Res. Utilizn*, 23(1-2) : 19-22.
33. Selvakumar, G. and Sundararaman, M., 2007. Diversity of Cyanobacterial flora in the backwaters of Palk Bay region, *Seweed Res. Utiln.*, 29(1-2): 139-144.
34. Strickland, J.D.H. and parsons, T.R., 1972. A practical hand book of seawater analysis, Bull. 67, Fish. Res. Bd. Canada, pp. 311.
35. Subramanian, G. and Thajuddin, N., 1995. Ecobiology of Marine Cyanobacteria. *Advances in Ecology and Environmental Sciences*;189-212.
36. Thajuddin, N. and G. Subramanian, 1991a. New report of marine cyanobacteria form the Southern East coast of India, *Phykos*, 30:19-23.
37. Thajuddin, N., 1991. Marine cyanobacteria of the Southern East coast of India – survey and ecobiological studies, ph.D. Thesis, Bharathidasan University, Tiruchirapalli.
38. Thajuddin, N., 1991b. Marine Cyanobacteria of the Southern east coast of India-Survey and ecobiological studies. Ph.D. Thesis, Bharathidasan University, Tiruchirappalli, India.
39. Thajuddin, N. and Subramanian, G., 2002. The enigmatic bloom forming marine cyanobacterium *Trichodesmium*. In *Advances in Marine and Antarctic Science* [Sahoo, D. Pandey, P.C. (eds.)].APH Publishing Co., New Delhi, pp. 57-89.