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Physico-chemical and Cyanophitic variation of Motia Tank, Bhopal

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Abstract

The present studies focused on Physico-chemical parameter and Cyanophitic diversity of Motia Tank. The physico-chemical parameters like temperature, water temperature, D.O., pH, free CO_2, Total alkalinity, total hardness, calcium hardness, chloride, phosphate and nitrate were studied to analyze the Motia Tank. The study area selected was Cyanophitic diversity has been done with scientific name in this Lake. These studies an attempt has been made to identify the taxa of Cyanophyta in Pre monsoon, monsoon, summer and Post monsoon from July, 2007 to June, 2009.

Key words : Cyanophyta, Bhopal, Motia Tank, Physico-chemical.

Motia Tank, a perennial water body is located adjacent to the Taj-ul-Masjid on the northwest of the Bhopal City. It is a man-made Lake, constructed in the late 19th Century A.D. It was initially meant to provide pre-prayer ablution facility to the Muslim devotees visiting the monumental Taj-ul-Masjid. The water body has important aesthetic value and is situated in the densely populated area of the old city of the Bhopal. It is surrounded on its northern side by the historic Taj Mahal palace, on the southern side by Asia's biggest mosque Taj-ul-Masjid, on the western side by picturesque architecture of Benazir Palace and on the east by Thelawala Sadak.

Motia Tank was constructed in the 19th century A.D. The famous Taj- ul- Masajid was constructed in the 20th Century. Before that Benazir Palace on the west bank and Taj Mahal Palace on the North bank were constructed adding beauty to the environment of the water body. In the mid 20th Century, Aalmi Tablighi Ijtima, the largest congregation of Muslim pilgrims in India was started at Taj-ul-Masajid campus adjacent to the Motia Tank. At that time about 15000 people attended the Ijtima. Later the number of attendees swelled to more than 3 lacs which came from different parts of the world. As per available record about 40 countries had

participates this festival Ijtima with more than 2000 Jamats belonging to different countries. It has been reported that it is the second largest Muslim religious activity after the Haj, being held at Makka. The Ijtima festival was organized in the month of December. All the people during Ijtima were earlier gathered near the Motia Tank. This grand religious festival had adverse effect on the water quality of Motia Tank. Earlier the temporary toilets were arranged just near the bank of Tank. In the temporary food outlets set up only to cater the Ijtima attendees, temporary furnaces were made for the food preparation, in which many tones of wood were used as fuel. The ash generated in the process was let into the water of the Tank, affecting its which was affected the water of the Tank. Since last 3 years, this Ijtima festival has been shifted to Eintkhedi village near Islam Nagar.

It is a part of the exemplary water management system constructed by Muslim rulers, which resembles the water management system of Islam nagar fort. On earlier days, the rainwater flowing down the Idgah Hills was collected at a point for supply to the Benazir palace. The wastewater from the palace used to join the Motia Tank, which subsequently trickled down to Munshi Hussain Khan Tank. Thus a level was maintained in the Tank.

Water level of any water body mainly depends upon the climatic condition specially the rainfall in the catchment areas, atmospheric temperature, evaporation and drawing of water for domestic use or any other uses. The depth of water of the Motia Tank markedly decreases in summer due to evaporation loss as well as due to draw of water for various uses. Studies revealed that the water level decreased gradually during October to June, when the lowest level was reached. Thereafter the level rises up again during rainy season in the month of July to September. Reasons for such fluctuations are greater evaporation during the summer months, which are characterized by high temperature and low relative humidity. This study conducted during 1991-92 does confirm that transpiration loss of water was not significant, since macrophytic vegetation was totally absent.

Fortnightly collections of water samples were collected from all the stations *i.e.* from four sampling stations of Motia Tank. Parameters such as atmospheric temperature, water temperature, D.O., pH and CO_2 were studied at the sampling stations as they are liable to change soon. Total alkalinity, total hardness, calcium hardness, chloride, phosphate, and nitrate parameters were analyzed in the laboratory on the same day of collection. The all physico-chemical parameters were determined adopting methods given by APHA[4], NEERI[21], Trivedi and Goyal[32] and Adoni[1].

The algal sample collection carried out with the help of truncated cone shape plankton net. The plankton net is made of bolting silk No.25 standard grade. This has an aperture size of 0.064mm. The concentrate was preserved in 4% formalin for study[35].

Detail of the physico-chemical characteristics of water of ponds the present study from July, 2007 to June, 2009 are given below. The data have been collected by the middle of the month when there was particularly no rain fall. The changes in physico-chemical parameters are the direct and indirect

indices of quality of ponds water. The proper analysis of these factors enables to characterize the degree of water pollution.

Physico-chemical observations :

The temperature of Motia Tank did not differ much. It range between 14.0°C to 31.0°C, the maximum temperature recorded in the month of May, 2008, during 2007-08, and second year maximum temperature was recorded in the month of May and June, 2009 and minimum temperature value was recorded in the month of January was both year. (Fig-1), Motia Tank the maximum D.O. value was 12.8 mg/litre in the month of March, 2009 and minimum was 5.2 mg/litre in the month of August, 2008 (Fig-2), pH of Motia Tank it ranges from 7.4 to 8.6. The maximum value of pH was observed in Motia Tank in the month of June. (Fig-3), free carbon dioxide value ranged recorded from 0.3 mg/litre to 2.8 mg/litre. During 2007-08 the maximum free carbon dioxide value in the month of June, 2008 and minimum value in the month of July, 2007 and January, 2008 and second year the maximum value was 2.8 mg/litre in the month of January, 2009 and minimum free carbon dioxide value recorded was 0.3 mg/litre in the month of April, 2009. In the month of February and March, 2009 free carbon dioxide value was nil (Fig-4), total hardness value ranged recorded from 32 mg/litre to 400 mg/litre. During 2007-08 the maximum total hardness value in the month of June, 2008 and minimum value in the month of September, 2007 and second year the maximum value was 394 mg/litre in the month of June, 2009 and minimum value recorded was 32 mg/litre in the month of November, 2008 (Fig-5), the calcium hardness value ranged recorded from 16.6 mg/litre to 41.5 mg/litre. During 2007-08 the maximum calcium hardness value in the month of June, 2008 and minimum value in the month of December, 2007 and second year the maximum value was 38.7 mg/litre in the month of April, 2009 and minimum value recorded was 22.8 mg/litre in the month of November, 2008 (Fig-6), chloride of Motia Tank did not differ much. The chloride content showed the highest value of 70 mg /litre in the month of June, 2008 and lowest value of 46 mg/litre in the month of February, 2008 (Fig-7), chloride of Motia Tank did not differ much. The chloride content showed the highest value of 70 mg /litre in the month of June, 2008 and lowest value of 46 mg/litre in the month of February, 2008 (Fig-8), Phosphate content range from 0.70 mg/litre to 1.16 mg/litre. In the month of April and June, 2009 the phosphate contents was minimum and in the month of December, 2007 the phosphate contents maximum (Fig-9), Nitrate content ranged from 0.008 mg/litre to 0.128 mg/litre. In the month of April, 2009 the nitrate contents was minimum and in the month of May, 2009 the nitrate contents maximum (Fig-10).

Seasonal variations are evident in all the physico-chemical parameters examined. Temperature is one of the most important ecological features that is a limiting factor for the growth and distribution of flora and fauna in any aquatic ecosystem. Many workers while discussing the periodicity distribution and growth of Cyanophyta have laid much stress on the water temperature. According to Stroikine[31], Hutchinson[13] and Lin[18] dense population of blue-green algae are often associated with fairly high water temperature. The distribution and growth of Cyanophyta members is attributed to high temperature

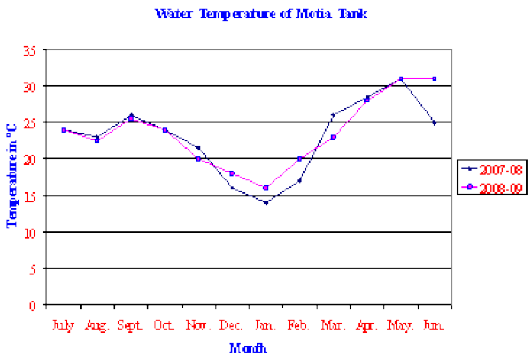

Fig-1

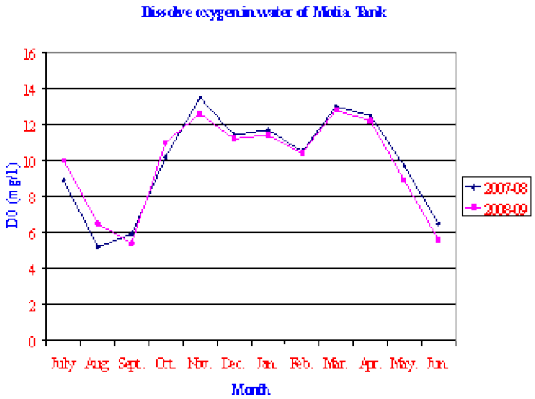

Fig-2

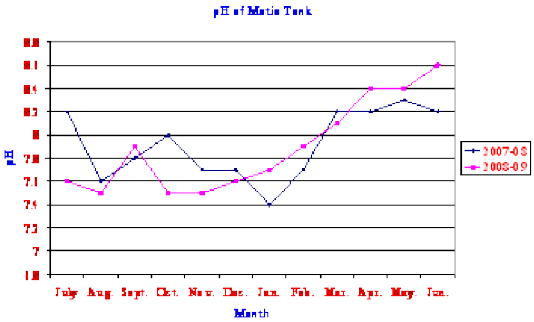

Fig-3

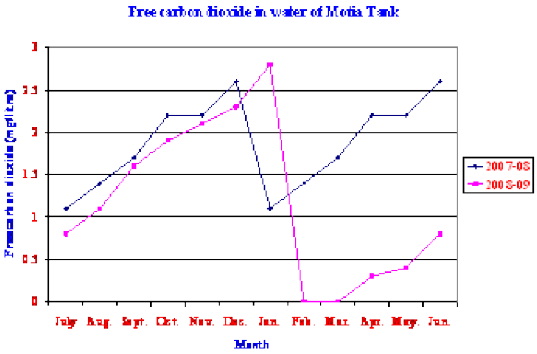

Fig-4

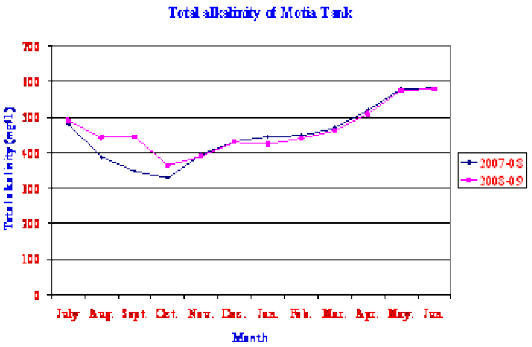

Fig-5

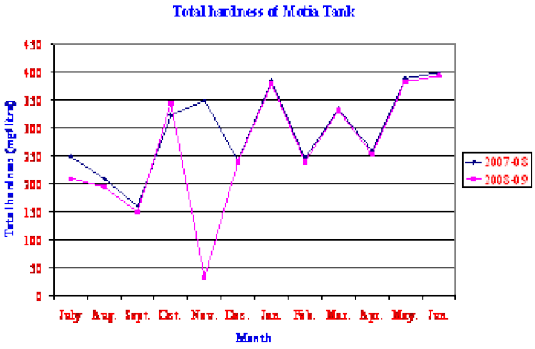

Fig-6

by Butcher[7]. Chakaraborty *et al.*,[8] and Venkateshwarlu[34] have also stressed the importance of water temperature in the periodicity of blue-green algae. Chu and Tiffany[9] and Rao[27] have stressed more on the significance of bright sunshine then temperature. Lin[18] observed that relatively high summer water temperature favored the blue-green algal

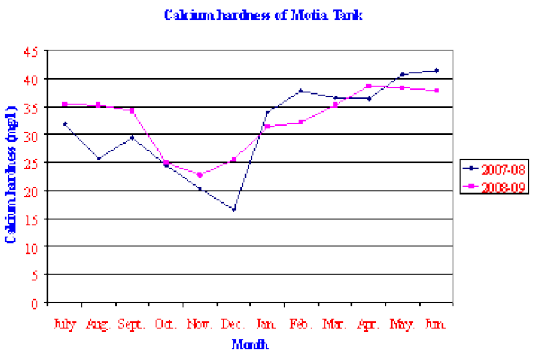

Fig-7

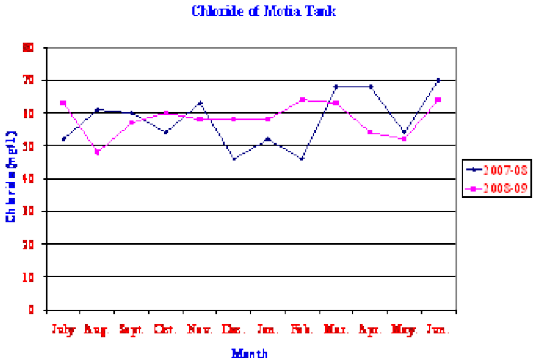

Fig-8

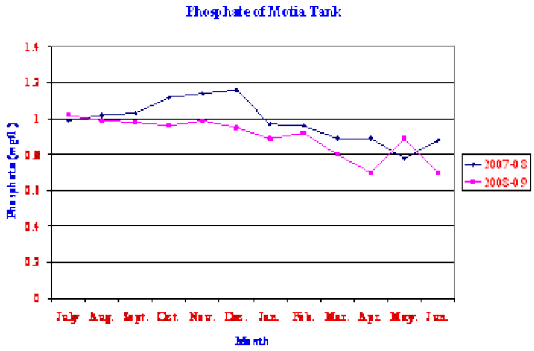

Fig-9

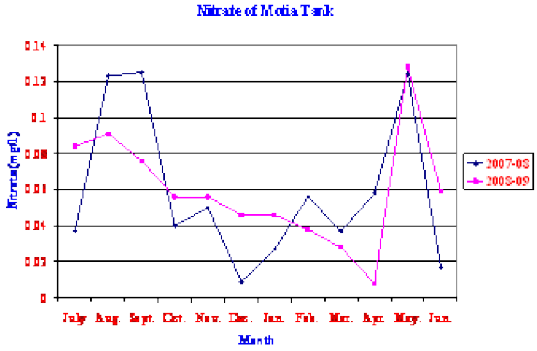

Fig-10

blooms and results in high concentration of organic matter. Pearsall[25] have pointed out that blue-green ware observed in summer. Kaliyamurthi[14] observed peak of blue-green algae in January to April and Singh and Swarup[28] noted peak in April to October, Zafar (1967), Biswas[6], Khare[15], Khare and Patil[17], Mahajan *et al.*[19] and Anand[5] have reported that blue-green started increasing in early summer and attained their maxima in the middle of summer season. According to Spancar and King[30] surface bloom of blue-green algae are present during the summer in many eutrophic lakes. Singhal[29] found Cyanophyta group dominating over other groups throughout the yaer and with peak in April. In previous observation on lake, Valecha[33] observed maxima growth of Cyanophyta in the month of June and minima in winter.

In the month of April, May and June oxidizable organic matter were increased with the increased temperature. Rao[27], Zafar[36], Parmasivam and Sreenivasan[23] have also confirmed the maximum of blue-greens with high concenteration of oxidizable organic matter. Desikachary[10] supported that bicarbonates plays significant role in the maxima of Cyanophyceae.

In the present study of Motia Tank found forty seven species of order Chroococcales were found such as *Microcystis aeruginosa, M. elongate, M. flos-aquae, M. protocystis, M. pseudofilamentosa, Chroococcus limneticus, C. micrococcus, C. minor, C. minutus, C. turgidus, Gloeothece rupestris, G. samoensis, Aphanocapsa pulchra, Aphanothece nidulans, A. pallida, Dactylococcopsis fascicularis, D. raphidiodes, Gomposphaeria aponica, G. lacustris, Merismopedia elegans, M. glauca, M. punctata* and *M. tenuissima.* order Nostocales such as *Arthospira jenneri, Oscillatoria acuta, O. amphibian, O. amphigranulata, O. chalybea, O. curviceps, O. foreaui, O. formosa, O. grunowiana, O. jasorevensis, O. laete-virens, O. laete-virens* Gomont var. *minimus, O. limosa, O. nigra, O. princeps, O. salina, O. sancta, O. subbrevis, Phormidium bohneri, P. calcicola, P. subincrustatum, Lyngbya hieronymusii, L. magnifica, L. majuscule, L. spirulinoides, Anabaenopsis arnoldii, Cylindrospermum doryphorum, C. indicum, C. sphaerica, Nostoc commune, N. sphericum, Anabaena ambigua, A. aphanizominoides, A. flos-aquae, A. spiroides, Raphidiopsis indica, Raphidiopsis mediterranea, Aulosira fritschii, Scytonema coactile, S. pascheri, Tolypothrix nodosa, Calothrix castellii, Rivularia aquatica, R. bacearіana, R. dura, Gloeotrichia kurziana,* and *G. raciborskii* var. *kashiense.*

The Motia Tank different genera in order of frequency of occurrence were *Oscillatoria* were dominant of 70 taxa and by predominance species of *Microcystis, Chroococcus,* and *Merismopedia, lyngbya, Merismopedia* and *Anabaena* in peak period of Motia Tank.

References :

1. Adoni, A.D. (1985). Work book of limnology, Pratibha Publication. Sagar. M.P. India.
2. Adoni, A.D., G. Joshi, K. Ghosh, S.K. Chourasia, A. K. Vaishya, M. Yadav and H.G. Verma (1985). Work Book on Limnology, Pratibha Publishers, Sagar, 1-216.
3. Agarkar, M. S. (1975). Ecology of Algae of Bhopal. Ph.D. Thesis of A.P.S. University, Rewa, India.
4. American Public Health Association (1998): Standard method for the examination of water and wastewater, 20th Edition, American Public Health Association Washington D C.
5. Anand, V. K. (1988). *J. Curr. Bio. Sci. 5(1):* 11-16.
6. Biswas, S. (1972). *Hydrobiologia, 39:* 377-388.
7. Butcher, R. W. (1924). *Naturalist* (175–180): 211- 214.
8. Chakaraborty, R.D., P. Roay and S.B. Singh (1959). *Indian Journal of Fisheries, 6(1):* 186-203.
9. Chu, Hao–Jan. and L. H. Tiffany (1951). *Ecology, 34* (4): 709 – 718.
10. Desikachary, T. V. (1959). Cyanophyta, I.C.A.R., New Delhi.
11. Geitler, L. (1932). Cyanophyceae. In *L Rabenhorst's Kryptogamen Flora, Akademische Verlagsgesellschaft,* Leipzig. 1196 pp.
12. Hammer, U. T. (1964). *Verh. Int. Verein Limnol., 15:* 829-836.
13. Hutchinson, G. E. (1967). A treatise on Limnology Vol. II. Introduction to lake biology and limnoplankon, New York. John Wiley and Sons, 1115 pp.
14. Kaliyamurthy, M. (1975). *Indian J. Fish.,*

22(1/2): 86-95.

15. Khare, B. (2007). *Env. Cons. Jou. 8* (1-2), 81-83.
16. Khare, B. (2010). Ecology of Certain Small Water Bodies of Bhopal with Special Reference to Cyanophyta; Ph.D. Thesis of Burkatullah University Bhopal, India.
17. Khare, B. and P. Patil (2011) *Indian Hydrobiology Journal Chennai 14* (1): 8-21.
18. Lin, C.K. (1972) *Hydrobiol., 39:* 321–334.
19. Mahajan S.K. and B. Khare, P. Mahajan (2010). *Env. Cons. Jou. 11* (1 & 2) 75-77.
20. Narayan, K. P., Shalini. Tiwari, Saurabh. Pabbi, Sunil. Dhar and Dolly Wattal (2006) *Current Sci. 91*(7): 10.
21. NEERI (1986). Laboratory manual on water analysis. Nation Environmental Engineering Research Institute, Nagpur.
22. Oommachan, L. (1981). Ecological studies on lower lake of Bhopal (M.P.) with special reference to benthic fauna. Ph.D. Thesis, Bhopal University, Bhopal, India.
23. Paramasivam, M. and Sereenivasan (1981). *Ind. J. of Envt. Hlth. 23*(3): 222-238.
24. Patil, P. (1982). An ecological study of the algal flora of lakes of Bhopal Ph.D. Thesis, Bhopal University, Bhopal, India.
25. Pearsall, W. H. (1932). *J. Ecol., 20:* 241–262.
26. Philipose, M. T. (1967). Chlorococcales. I.C.A.R., New Delhi.
27. Rao, C.B. (1955). *J. Ecol., 43:* 291 – 308.
28. Singh, S. R. and Swarup, K. (1979). *J. Ind. Bot. Soc., 58*(4): 319-332.
29. Singhal, R.N., Swarnjeet and R.W. Davis (1986). *Proc. Ind. Acd. Ani. Sci. 95*(3): 353-364.
30. Spencer, C.N. and D. L. King (1989). *J. Plankton Res., 11*(2): 287-296.
31. Stroikine, V.C. (1963). *Kuivyshev, 3 :* 111–117.
32. Trivedi, R.K. and P.K. Goyal (1986). Chemical and biological methods for Water Pollution Studies. Environmental publications, Karad, India. P. 215.
33. Valecha, V. (1985). Ecology of Phyto-plankton in Lower Lake of Bhopal, Ph.D. Thesis. Bhopal University, Bhopal.
34. Venkateswarlu, V. (1969). *Hydrobiol., 33* (1 – 2) : 352 – 368.
35. Welch, P. S. (1952). Limnology. 2nd Ed. Mc Gram Hill Book Co., Inc., 1 – 538.
36. Zafar, A. R. (1967). *Hydrobiologia, 30(1):* 96-112.