Research Article [Patel & Vediya, 5(9): Sep., 2014:3807-3812]
CODEN (USA): IJPLCP ISSN: 0976-7126

INTERNATIONAL JOURNAL OF PHARMACY & LIFE SCIENCES
(Int. J. of Pharm. Life Sci.)

Seasonal Variations in Physico – Chemical Characteristics of Soil in Sola and Gota Lakes of Ahmadabad, Gujarat, India

Satish Patel *and Sanjay Vediya
P.G.Center in Botany, Sir P.T. Science College, Modasa, (Gujrat) - India

Abstract

The present study was carried out to determine the physicochemical characteristics of soil in Sola and Gota lakes of Ahmadabad –Gujarat, for period of two years during 2009-2010. The minimum and maximum values of pH varied from 6.2 to 8.4 respectively .variation in EC 1.98 to 1.1 moh. Moisture content 15.25% to 39.0 % and Water holding capacity (WHC) 37.0 to53.0 % were in good amounts in soils. Concentrations of nutrients viz. Total Nitrogen (5.0 to 1.0 ppm), Total phosphorus ranged Between 0.77 to 3.3 µg/g, total Organic Carbon varied from 0.37 % to 1.98 % and total organic Matter Varied from 0.56% to 11.6% respectively in all two lakes.

Key-Words: *Lake, Sola Lake, Gota Lake, Physico-chemical*

Introduction

Ahmadabad is unique in the whole of India in matter of environmental neatness and flourishing conditions and it is superior to other cities in the excellence of its monuments. Ahmadabad Urban development Authority (AUDA) carried out a survey of 645 lakes and identified 22 lakes which have been severely degraded. AUDA proposes to undertake works for revival, development of catchments area and beautification of lakes under the present project. Of these, 2 lakes were studied which are Gota lake is located at north-east of Gota village. Its total storage capacity is 20.0crore liters and surface area 667 M. Sola Lake is located at Sola village. Its total storage capacity is 24.6crore liters and Lake Circumference is 1364 M. looking to high population pressure in the city; all the lakes are under threat of pollution. Pollution is one of the most burning problems before mankind. It causes damages to the human being on the hand and his property (forest land, crop, animals, Industrial Area etc.) the Pollution is an undesirable change in the physical in the physical, chemical or biological characteristic of air, water and soil that have harmful effect on the life or create a potential health hazard of any living organisms. Soil is derived from the Latin word "Solum" which means earthly material in which plant growth takes place. Soil is a natural body consisting of layers (soil horizons) of mineral constituents of variable thicknesses, which differ from the parent materials in their morphological, physical, chemical, and mineralogical characteristics.

*** Corresponding Author**
E-mail: shrisatish82@gmail.com

It is composed of particles of broken rock that have been altered by chemical and environmental processes that include weathering and erosion. Soil is essential for survival of the living world, especially for human population. Soil is a dynamic medium made up of minerals, organic matter, water, air and living creatures including bacteria and earthworms. It was formed and is forever changing due to physical factors; the parent material, time, the climate, the organisms present (Anu, Upadhyaya S.K, and Bajipai Avinash-2010). The contamination of soil, sediment resource and biota by heavy metals is one of the Major concerns especially in many industrialized countries because of their toxicity persistence and bioaccumulation (Iken *et al*., 2003).

The aim of the present study is to determine the spatial and temporal distribution of physical variables (EC) chemical variables (pH, E.C, Moisture contain, water Holding Capacity, Total nitrogen, Total phosphorus, total organic carbon and total organic matter) in addition to Soil and sediment of Gota and Sola lakes during January-2009 to December-2010 of drought period to assess the environmental status of the Soil-sediment of Chandlodia and Gota Lakes, Ahmadabad.

Material and Methods

Physico-Chemical analysis of Soil

The present study was done during drought period (Summer ,Monsoon and Winter 2009 to2010) ,Bottom sediment were collected by means of a tubular sampler of the scoop type that allowed taking about 15cm deep samples. Samples were air-dried, cursed, sieved 2.0mm sieves (State Chemistry Laboratory, Method 004, July 1986) stored in plastic containers. The soil and sediment sample collected were during Seasonal of

drought period. Different point was selected along locality 1.Sola Lake and locality 2.Gota lake, Ahmadabad.

pH: The pH of above suspension is determined using a calomel electrode and digital pH meter (State Chemistry Laboratory, Method 004, July 1986).

Electrical conductivity: This taste is used to estimate the concentration of soluble salts in the soil. Measurement dip cell and direct reading meter (State Chemistry Laboratory, Method 004, July 1986).

Moisture content and water holding capacity: Moisture content and water holding capacity was computed following Saxena (1989).

Total organic matter and Total organic carbon (TOC): Soil samples were collected from two lakes (Gota and Sola). Samples were collected in this month January-2009 to December -2010 following were analyzed using standard methods given by APHA, 1998.

Total phosphorus and Total nitrogen: Content of sediment samples were estimated by the methods of El Wakeel and Riley (1956) and Rochford (1951) and using standard methods given by APHA, 1998.

Results and Discussion

The selected physico-chemical properties which can be used as the indicator of the soil are

Presented in table 1 to 8.

The physical and chemical characteristics of the Gota and Sola lake soil parameters are considered as the most important principles in the identification of the nature, quality and type of the water (fresh, brackish or saline) for any aquatic ecosystem (Abdo, 2005).

The study area is generally alkaline in nature with **pH** ranging from lowest concentration 6.2 in Summer-2010 and highest concentration 8.4 in Monsoon-2010 at locality-2, Fig-1.

EC is an indirect measure of ionic strength and mineralization of natural water .EC of pure water is 0.05µs/cm (Hem, 1991) EC highest Range from 1.98moh Winter-2009 locality-1 and lowest range from 1.1 moh in winter-2010 at locality no-2 given Fig.2

Water holding capacity (WHC) and moisture content at locality 1 winter-2009 and locality 2 Monson-2010 was highest among others 37 to 53% and Moisture content 15.25 to39.0 % during Summer 2009 and 2010 at locality no. 2 respectively. This can be attributed to the presence of high amount of sewage sludge dumped by nearby sewage treatment plant which holds good amount of water during rainy season. These two properties of the soil were higher as compared to other dumpsite soils possible due to the presence of more clay texture in the soil (Fig-3 andFig-4).

Total nitrogen values varied from 5.0 ppm winter-2010 at locality no.2 and 1.0 ppm winter 2009 at locality no-1 respectively. Another possible way of nitrate entry is through oxidation of ammonia form of nitrogen to nitrite and then consequently to nitrate (Rajasegar, 2003). The low values recorded during non-monsoon period may be Due to utilization by phytoplankton as evidenced by high photosynthetic activity and the dominance of water having negligible amount of nitrate (Das *et al*., 1997). The higher value of nitrite recorded during winter season may be due to various reasons including variation in phytoplankton excretion, oxidation of ammonia and reduction of nitrate and by recycling of nitrogen and bacterial decomposition of planktonic detritus present in the environment (Govindasamy *et al.*, 2000) given by Fig-5.

The high concentration of **Total phosphorus** observed during 2009 to 2010 at locality-1and 2 lowest concentration of phosphorus observed summer and winter 2010 (3.3 to 0.77µg/g) Further, regeneration and release of total phosphorus from bottom mud into the water column by turbulence and mixing also contributed to the higher values during monsoon (Chandran and Ramamoorthy, 1984). In the present study, influx of nutrients from hinterland appears to be negligible, apparently due to higher rainfall and numerous water harvesting structures in lakes which stop even meager land runoff. Hence, the increase of nutrients during summer might be due to influx from neritic waters as inferred by Mishra *et al.* (1993) and Ragothaman and Jaiswal (1995**)** given Fig-6.

The High Concentration of **Total organic carbon (TOC)** Observed during winter 2010 (1.98%) and lowest concentration of winter 2009 (0.37%) in locality no-1 and 2 (Fig-7). The distribution of total organic carbon closely followed the Distribution of sediment type i.e., sediment low in clay content was low in total organic carbon and as the clay content increased, the total organic carbon content also increased which as reported by Reddy and Hariharan (1986)**.** In the present study the total organic carbon value was low during monsoon and high during summer season. An abundant supply of organic matter in the water column, relatively rapid rate of Accumulation of fine grained inorganic matter and low O2 content of the water immediately above the bottom sediments would favor high organic matter in the bottom sediments (Sverdrup *et al*., 1942). The organic carbon in lake sediments is derived from primary production within the aquatic ecosystem (autochthonous sources) and also from terrestrial biota

(allochthonous sources) by transport of leached and eroded material into the lake (Likens, 1972).

The High Concentration of **Total organic matter** observed during summer 2009 (11.6%) and lowest concentration of observed summer 2010 (0.56%) in locality-2 given Fig-8.

Conclusion

From previous discussion mentioned we can conclude that, the sediment quality Physico-chemical parameters were slightly increased especially EC and pH during drought period. The order of detected total phosphorus ,total organic matter, total organic carbon and total nitrogen in Soil and sediment were arranged from high to low concentrations as follows: > Water Holding Capacity>Moisture contain> Total organic matter >pH>total Nitrogen>Total phosphorus > Organic carbon and E.C respectively. The present baseline information of the physicochemical Characteristics of soil would form a useful tool for further ecological assessment and monitoring of these Lakes ecosystems of Sola and Gota lakes.

Acknowledgement

I am thankful to the Department biotechnology and Department of Space, Government of India for the financial support, Andaman and Nicobar Forest Department for their co-operation during field work. Special thanks are due to the Prof. P.K.Mukherjee and Chandana Ghaosh, Calcutta University Dept. of Botany for their suggestions and encouragements.

References

1. Abdo, M. H. (2005). Physico-chemical characteristics of Abu Za'baal Ponds, Egypt. Egyptian *J. of aquaticresearch*, 31(2): 1 – 15.
2. Anu, Upadhyaya S.K, Bajipai Avinash (2010): Seasonal Analysis of Soil Sediment of Shahpura Lake of Bhopal (M.P). *International Journal of Environmental Science and development*, 1(4): ISSN: 0264.
3. A.P.H.A. (1998): Standard Methods for Examination of Water and Waste water .20th Ed. American Public Health Association, Washington, D.C.
4. Chandran, R. and K. Ramamoorthy (1984): Hydrobiological studies in the gradient zone of the Vellar estuary- Nutrients. *Mahasagar-Bull. Nat. Inst.Oceanogr*., 17, 133-140.
5. Das, J., S.N. Das and R.K. Sahoo (1997): Semidiurnal variation of some physicochemical parameters in the Mahanadi estuary, east coast of India. *Indian J. Mar. Sci*., 26, 323-326.
6. El Wakeel, S.K. and J.P. Riley (1956): The determination of organic carbon in marine mud. *J. du conseil permanent Intl.* Pourl exploration de la mer., 22, 180-183.
7. Govindasamy, C., L. Kannan and Jayapaul Azariah (2000): Seasonal variation in physico-chemical properties and primary production in the coastal water biotopes of Coromandel coast, India. *J.Environ. Biol.*, 21, 1-7.
8. Hem, I.D., (1991): Study and Interpretation of the Chemical Characteristic of Natural Waters. 3rd Edn., US
9. Iken, A.; Egiebro, N. O. and Nyavor, K. (2003): Trace elements in water, fish and sediment from Tuskegee Lake, South Eastern, USA. *Air, Water and Soil Pollution*. 149: 51 – 75.
10. Likens, G.E. (1972): Nutrients and eutrophication. Special symposium American society of Limnology and Oceanography, Lawrence. p. 3
11. Mishra, Sujatha, D. Panda and R.C. Panigrahy(1993): Physico-chemical characteristics of the Bahuda estuary (Orissa), east coast of India. *Ind.J. Mar. Sci.*, 22, 75-77.
12. Ragothaman, G. and R.N. Jaiswal (1995): Studies on the hydrobiology of Tapi river from Jalgon region (Maharashtra) with reference to phytoplankton. *Pollut. Res.*, 14, 181-194.
13. Rajasegar, M. (2003): Physico-chemical characteristics of the Vellar estuary in relation to shrimp farming. *J. Environ. Biol*., 24, 95-101.
14. Reddy, Venkataswamy, H.R. and V. Hariharan (1986): Distribution of nutrients in the sediments of the Netravathi-Gurupur estuary, Mangalore. *Ind. J. Fish.*, 33, 123-126.
15. Rochford, D.J. (1951): Studies on Australian estuarine hydrology. In: Introductory and comparative features. *Aust. J. Mar. Freshwat. Res*., 2, 1-113.
16. Saxena, M.M., (1987): Environmental analysis -Water, Soil and Air, 2nd edition, Agro
17. Botanical Pulishers (India), pp 123-148.
18. State Chemistry Laboratory, Method (1986) 004.
19. Sverdrup, V., M.W. Johnson and R.H. Fleming (1942): The oceans, their physics, chemistry and general biology. Prentice Hall, New York. p. 1087.

Fig. 1: Analysis of pH in Soil of various lakes during the year 2009-2010

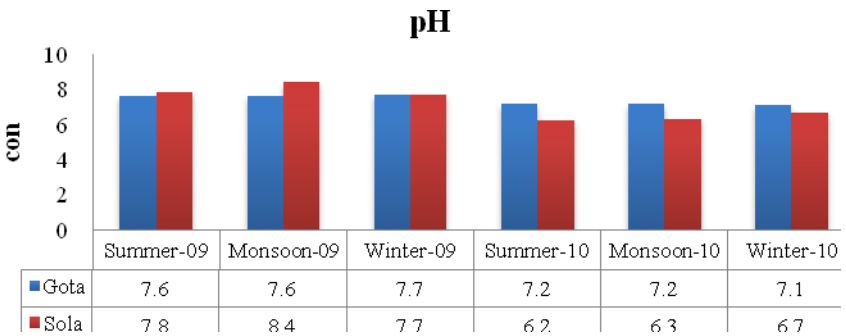


Fig. 2: Analysis of E.C (Moh) in Soil of various lakes during the year 2009-2010

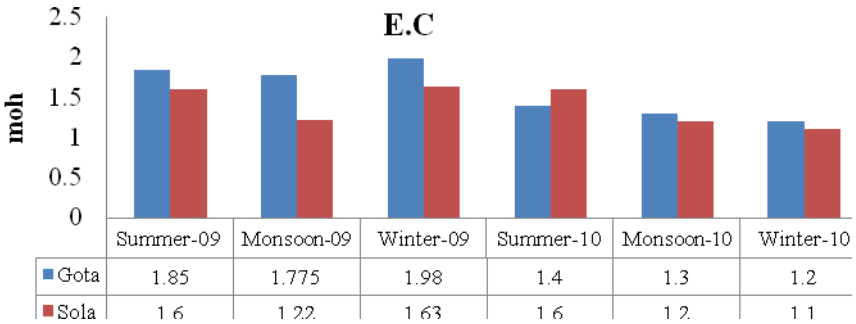


Fig. 3: Analysis of WHC (%) in Soil of various lakes during the year 2009-2010

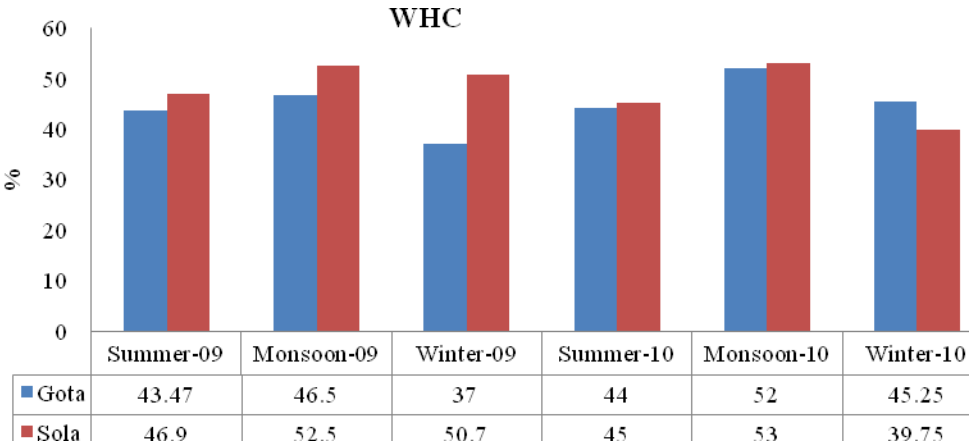
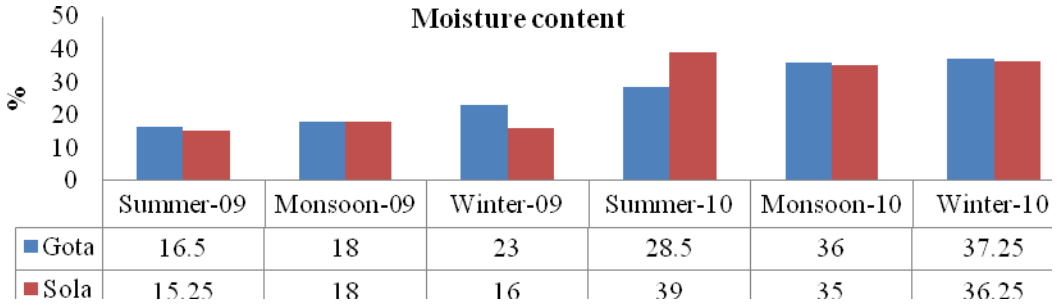
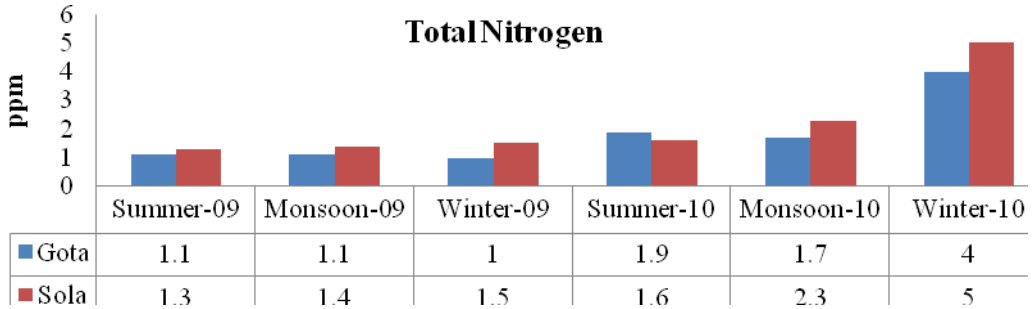


Fig. 4: Analysis of Moisture content (%) in Soil of various lakes during the year 2009-2010



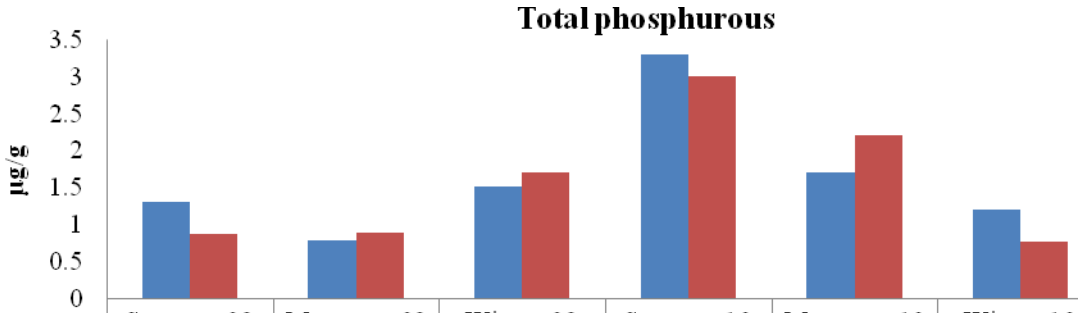
	Summer-09	Monsoon-09	Winter-09	Summer-10	Monsoon-10	Winter-10
Gota	16.5	18	23	28.5	36	37.25
Sola	15.25	18	16	39	35	36.25

Fig. 5: Analysis of Total nitrogen (ppm) in Soil of various lakes during the year 2009-2010



	Summer-09	Monsoon-09	Winter-09	Summer-10	Monsoon-10	Winter-10
Gota	1.1	1.1	1	1.9	1.7	4
Sola	1.3	1.4	1.5	1.6	2.3	5

Fig. 6: Analysis of Total lakes phosphorus (µg/g) in Soil of various during the year 2009-2010



	Summer-09	Monsoon-09	Winter-09	Summer-10	Monsoon-10	Winter-10
Gota	1.3	0.78	1.5	3.3	1.7	1.2
Sola	0.87	0.88	1.7	3	2.2	0.77

Fig. 7: Analysis of Total organic carbon (TOC) (%) in Soil of various lakes during the year 2009-2010

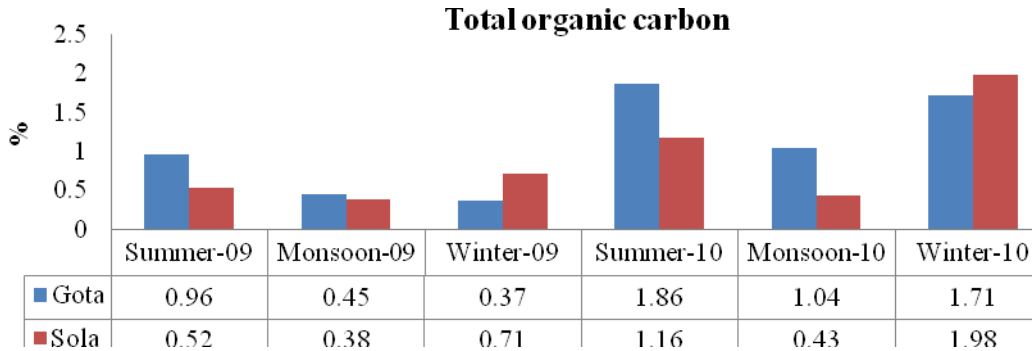
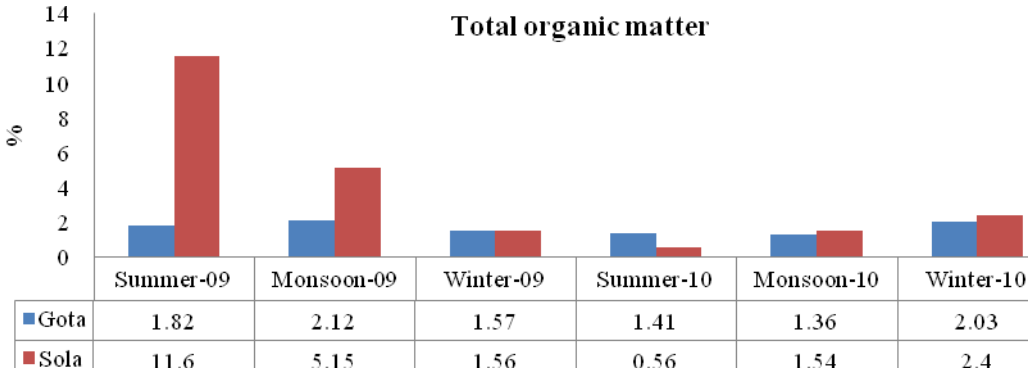


Fig. 8: Analysis of Total organic matter (%) in Soil of various lakes during the year 2009-2010



How to cite this article

Patel S. and Vediya S. (2014). Seasonal Variations in Physico – Chemical Characteristics of Soil in Sola and Gota Lakes of Ahmadabad, Gujarat, India. *Int. J. Pharm. Life Sci.*, 5(9):3807-3812.

Source of Support: Nil; Conflict of Interest: None declared

Received: 05.08.14; Revised: 14.08.14; Accepted:21.08.14