

Correlation of Some Physico-Parameters with Chemical and Biological Parameter of Munj Sagar Talab, Dhar (M.P.) India

¹Amita Dagaonkar, ³Man Mohan Prakash and ²Nagesh Dagaonkar

¹Department of Biotechnology and Zoology,

²Department of Physics, Govt. P.G. College, Dhar (M.P.), India

³Department of Zoology, Govt. Holkar Science College, Indore (M.P.), India

Abstract: This study was aimed to estimate current status of physico-chemical characteristic of Munj Sagar Talab Dhar, Madhya Pradesh. Monthly changes in physico-chemical and biological parameters, such as water temperature, transparency, conductivity, turbidity, phytoplankton and zooplankton were analyzed for a period of 2 years from November, 2006 to October, 2008. The results indicated that physico-chemical and biological parameters of the water were within the permissible limits and can be used for domestic, irrigation and pisciculture.

Key words: Correlation, physico-chemical parameters, temperature, transparency, conductivity, turbidity, phytoplankton, zooplankton

INTRODUCTION

The overall condition or health of aquatic ecosystems is determined by the interaction of its physical, chemical and biological components. In order to protect the ecosystem, understanding of environmental changes is necessary. Ecological assessment helps us to conserve and manage natural resources. There are several statistical methods, such as co-relation, smoothing of data, regression and cluster analysis which may be helpful in predicting and planning the ecosystem. Correlation among the water quality parameters has been reported by Somasekhara and Somasewara (1994), Prakash (1994), Tiwari and Ali (1988), Mariappan *et al.* (2000), Jeyaraj *et al.* (2002), Rao (2002), Tyagi *et al.* (2003), Mohanty *et al.* (2003) and Thirupathiah *et al.* (2012).

MATERIALS AND METHODS

About the water body: Munj Sagar is located in the district Dhar. It was excavated by Vakpati Munja (993AD) who was the famous ruler of Paramaras dynasty. Munja was a great general, a poet of repute and a great patron of art and literature. Munj Sagar Talab is geographically located at 22°30'06.67" North and 75°17'42.67" East latitude. It covers an area of about 49.596 h. The altitude of Munj Sagar Talab is 554 m. In year 2005, it was deepened by removing the bottom soil. This water body was basically constructed for drinking water purpose but now-a-days its water is mainly utilized for irrigation and fish culture.

Physico-chemical methods of water analysis

The collection of samples: The samples were collected in the 1st week of every month from November, 2006 to October, 2008 between 7-9 a.m. For the collection of water samples, iodine treated polyethylene bottles were used. All the precautions were taken to avoid air bubbles during the sampling. Some of the physical and chemical parameters, such as depth, transparency, water temperature, dissolved oxygen, free carbon dioxide, alkalinity, hardness and chloride were determined at the sampling station because these characteristics of water might change with passage of time while the other characteristics were determined in the laboratory within a period of 5-6 h of sampling. The samples for zooplankton and phytoplankton were also collected in the continuation after the collection of water samples at each station.

Water analysis: The physical and chemical parameters of water samples were analyzed by following standard method for the examination of water and waste water and chemical and biological methods for water pollution studies.

RESULTS AND DISCUSSION

A correlation matrix and correlation significances matrix between physico-chemical and biological parameters was obtained using StatiXL software. The $p < 0.05$ was considered as significant level during this study.

The water temperature ranged in between 16.7-33.90°C in 2006-2007 and 18.03-34.03°C in 2007-2008. The minimum temperature was observed in December, 2006 and maximum was noted in June, 2008, the transparency of water varied from 23.43-49.40 cm in 2006-2007 and 21.63-47.43 cm in 2007-2008. The minimum and maximum values were found in June, 2008 and December, 2007, respectively.

The conductivity ranged from 219.0-316.33 $\mu\Omega\text{ cm}^{-1}$ in 2006-2007 and 214.67-309.67 $\mu\Omega\text{ cm}^{-1}$ in 2007-2008 the minimum and maximum values were noted in

December and July, 2007, respectively the turbidity ranged in between 9.47-38.97 NTU in 2006-2007 and 11.13-40.33 NTU in 2007-2008. The minimum and maximum values were found in December, 2006 and June, 2008. The correlation are reported and shown in Fig. 1-4.

A positive correlation between water temperature, turbidity (Kaushik and Saksena, 1991), free carbon dioxide (Kamal *et al.*, 2007), chloride (Kumarai and Anshjali, 2007), conductivity, BOD (Rajagopal *et al.*, 2010) temperature and DO (Parikh and Mankodi, 2010) were described. While negative correlation with water

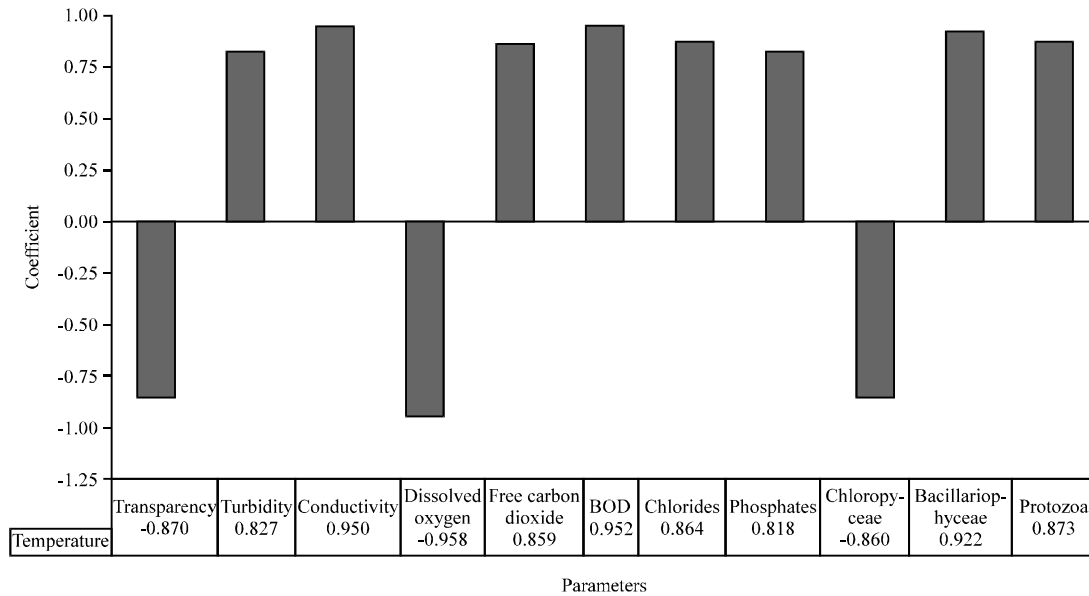


Fig. 1: The significance correlations between temperature and different parameters

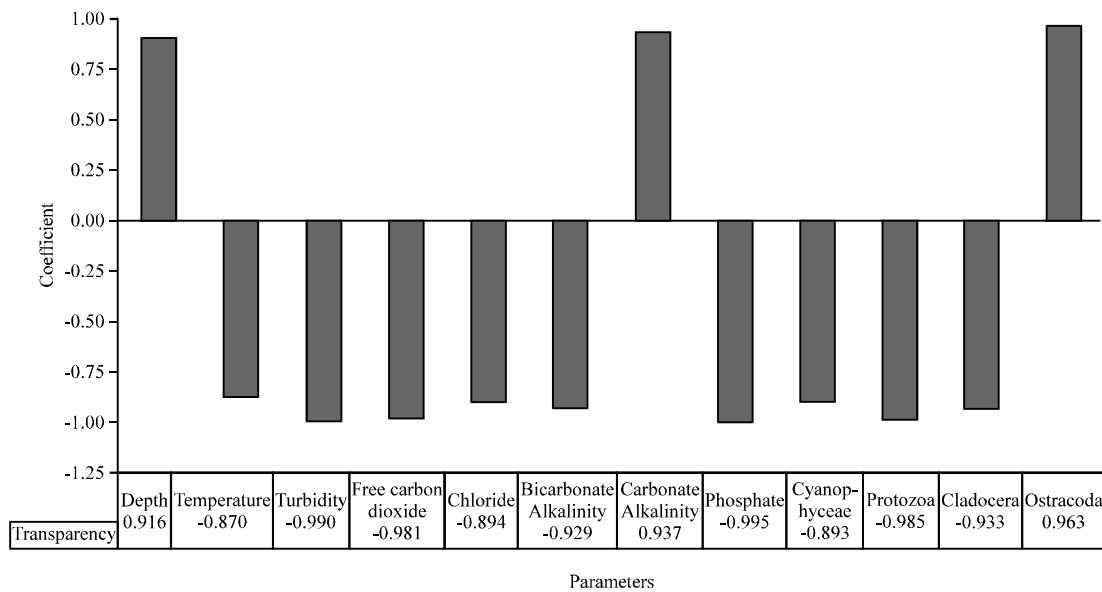


Fig. 2: The significance correlations between transparency and different parameters

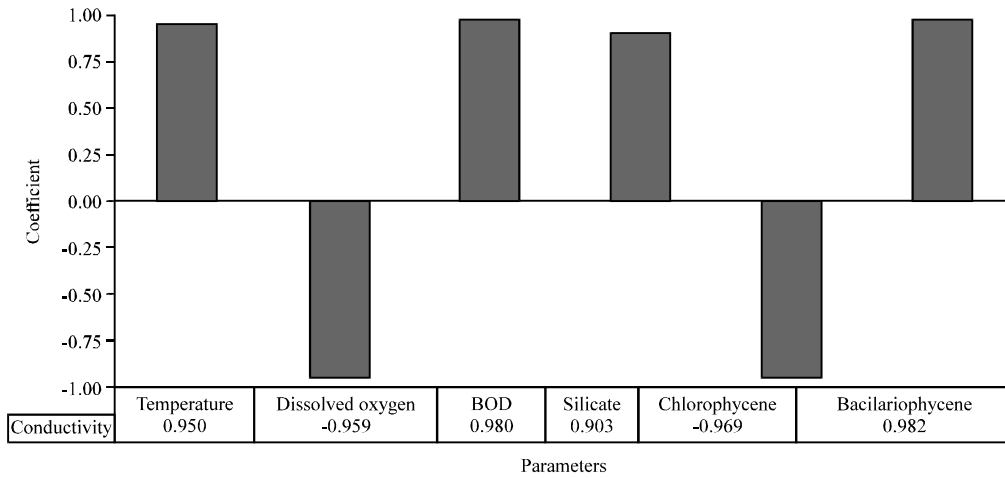


Fig. 3: The significance correlations between conductivity and different parameters

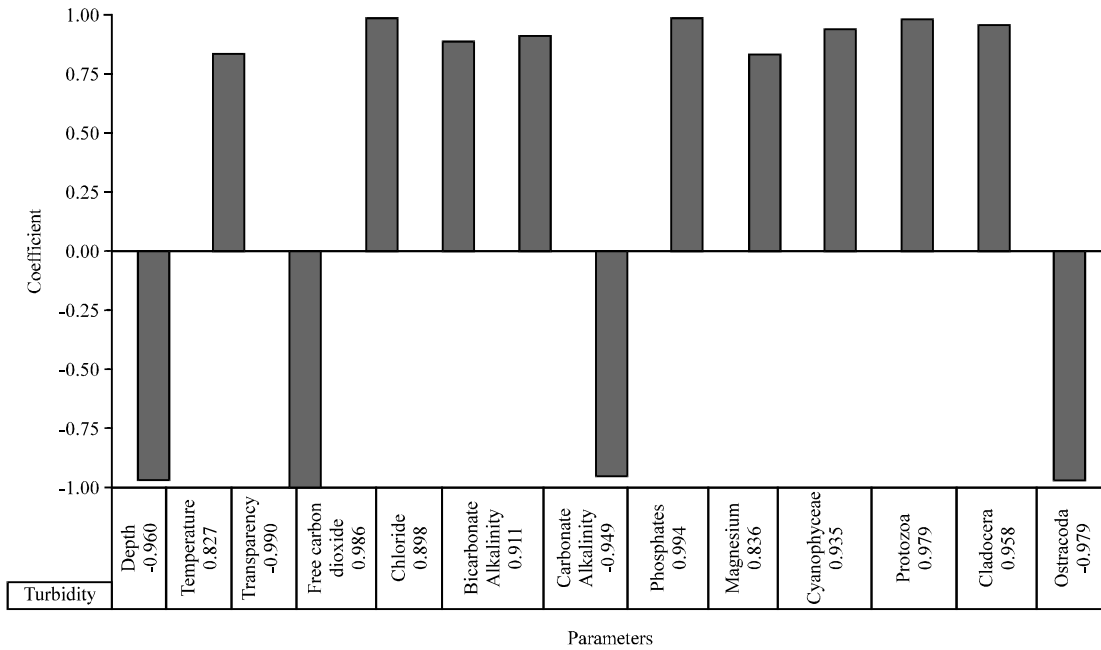


Fig. 4: The significance correlations between conductivity and different parameters; significnace correlations of turbidity

temperature and transparency (Sunita *et al.*, 2007), dissolved oxygen (Hamman, 1979) was described.

In the present study, water temperature showed positive correlation with turbidity, TDS, conductivity, free carbon dioxide, BOD, chloride and phosphate while negative correlation of water temperature with transparency and dissolved oxygen was observed.

A positive correlation between transparency, phosphate, nitrate, TDS, DO, free CO₂ (Nair *et al.*, 1980) while negative correlation between transparency and turbidity was observed by Kamal *et al.* (2007).

In the present study, transparency showed positive correlation with depth and carbonate alkalinity while negative correlation of transparency with temperature, turbidity, free CO₂, chloride, bicarbonate alkalinity and phosphate was observed.

A positive correlation of electric conductivity with TDS, chloride, alkalinity (Mehta, 2010), pH, turbidity, TDS, alkalinity (Bala and Mukherjee, 2010) while negative correlation between electric conductivity and DO was reported by Rajagopal *et al.* (2010). In the present study, electric conductivity showed the positive correlation with

temperature, BOD, silicate while negative correlation with DO. Abdel-Satar (2001) reported a positive correlation of TDS with conductivity.

Kumarai and Anshjali (2007) reported the positive correlation of turbidity with TDS, BOD, hardness, magnesium while negative correlation of turbidity with phosphate, nitrate was reported by Kamal *et al.* (2007).

In the present study, turbidity showed the positive correlation with temperature, free CO₂, chloride, bicarbonate alkalinity, phosphate and Magnesium while negative correlation with depth, transparency and carbonate alkalinity.

CONCLUSION

The present study summarizes, the seasonal fluctuation in various physico-chemical and biological parameters in water of Mujnj Sagar Talab as exploratory statistical data. The interrelationship between various parameters suggests the association of physico-chemical parameters with biological parameters.

REFERENCES

- Abdel-Satar, A.M., 2001. Environmental studies on the impact of the drains effluent upon the Southern sector of Lake Manzalah. Egypt. J. Aquat. Biol. Fish, 5: 17-30.
- Bala, G. and A. Mukherjee, 2010. Statistical studies on the surface water of some wetlands in nadia, West Bengal. Int. J. Lakes Rivers, 3: 87-95.
- Hannan, H.E., 1979. Chemical Modification in Reservoir Regulated Streams. In: The Ecology of Neglected Streams, Ward, J.W. and J.A. Stanford (Ed.). Plenum Press, New York, pp: 75-94.
- Jeyaraj, T., S. Padmavathy, S. Shirley and H. Jebakumari, 2002. Correlation among water quality parameters for groundwater sample of Bharathi Nagar of Tiruchirapalli city. Indian J. Environ. Prot., 22: 755-759.
- Kamal, D., A.N. Khan, M.A. Rahman and F. Ahamad, 2007. Study on physico chemical properties of water of Mourt River, Khulna, Bangladesh. Pak. J. Biol. Sci., 10: 710-717.
- Kaushik, S. and D.N. Saksena, 1991. Physico-Chemical Limnology of Certain Bodies of Central India. In: Fresh Water Ecosystem of India, Kumar K.V. (Ed.). Daya Publishing House, New Delhi, pp: 1-58.
- Kumarai, N. and G.S. Anshjali, 2007. Impact of coal mining on ponds of Jharia town, Dhanbad, Jharkhand. Proceedings of the 1st International Conference on MSECMI, November 19-21, 2007, New Delhi.
- Mariappan, P., V. Yegnaraman and T. Vasudevan, 2000. Correlation between water table level and fluoride content in the ground waters of Salem district, Tamil-Nadu. Pollut. Res., 19: 231-235.
- Mehta, K.V., 2010. Physicochemical characteristics and statistical study of groundwater of some places of Vadgam taluka in Banaskantha district of Gujarat state (India). J. Chem. Pharm. Res., 2: 663-670.
- Mohanty, S.K., D. Patnaik and S.P. Rout, 2003. Correlation study among groundwater quality parameters near major industries in Koraput. Indian J. Environ. Prot., 23: 1283-1288.
- Nair, B.M.S., O.N. Seth and K.D. Mishra, 1980. Limnological studies on a village pond, India, physicochemical characteristics. Proceedings of the National Symposium, Past Present and Future Bhopal, pp: 195-201.
- Parikh, A.N. and P.C. Mankodi, 2010. Limnological status of the urban pond sama, Vadodara, Gujarat. Indian J. Environ. Ecoplan, 17: 397-402.
- Prakash, M.M., 1994. Seasonal variation in the physico-chemical characteristic of a perennial pond of Jhabua, Madhya Pradesh. J. Aqu. Biol. Fish., 1: 43-47.
- Rajagopal, T., A. Thangamani, S.P. Sevarkodiyone, M. Sekar and G. Archunan, 2010. Zooplankton diversity and physico-chemical conditions in three perennial ponds of Virudhunagar district, Tamilnadu. J. Environ. Biol., 31: 265-272.
- Rao, S.V.L., 2002. Correlations among the chemical constituents of ground waters of Venkatagiri taluq, Nellore. Indian J. Environ. Prot., 22: 170-172.
- Somasekhara, R.K. and R.B. Somasewara, 1994. Correlations among water quality parameters of ground waters of Musunur Mandal, Krishna district. Indian J. Environ. Prot., 14: 528-532.
- Sunita, K., C. Ghosh and G. Jayaraman, 2007. Phytoplankton composition, community structure and regional climatic variations in two tropical model ponds in India. Asian J. Water Environ. Pollut., 4: 123-128.
- Thirupathaiah, M., C. Samatha and C. Sammaiah, 2012. Analysis of water quality using physico-chemical parameters in lower manair reservoir of Karimnagar district, Andhra Pradesh. Int. J. Environ. Sci., 3: 172-180.
- Tiwari, T.N. and M. Ali, 1988. Correlations among water quality parameters of industrial wastes I: Sugar industry. Indian J. Environ. Prot., 8: 43-47.
- Tyagi, P., D. Budhi and R.L. Sawhney, 2003. A correlation among physico-chemical parameters of ground water in and around Pithampur industrial area. Indian J. Environ. Prot., 23: 1276-1282.