International Journal of Pure and Applied Zoology
Volume 2, Issue 3, pp: 261-265, 2014

ISSN (Print) : 2320-9577
ISSN (Online): 2320-9585
http://www.ijpaz.com

Research Article

CHARACTERIZATION OF PERENNIAL POND WATER NEAR ERODE CITY, TAMILNADU, INDIA FOR AQUACULTURE

A. Parithabhanu* R. Revathi and S. Vijayaragavan
PG and Research Department of Zoology, C.N. College, Erode-368004, Tamilnadu, India

Article History: Received 24th June 2014; Accepted 3rd August 2014; Published 6th August 2014

ABSTRACT

A local perennial pond near Erode city was selected in the present study. The water sample collected from the pond was analysed and various parameters exhibited only little variations in quality. The pond water was used as a medium to rear the fingerlings of *Oreochromis mossambicus* to judge the quality of water for aquaculture. As the fingerlings died in the raw pond water, they were reared in various concentration of pond water to study the growth pattern through length weight relationship. As the pond water exerted very little deviations in growth. It is recommended to monitor the pond water properly to be utilized for future aquaculture practices.

Keywords: *Oreochromis mossambicus,* Pond water, Fingerlings, Aquaculture.

INTRODUCTION

The problem of pollution is mainly linked with human activities and is met with by both the developed as well as the developing countries (Prasanthan and Vasudeva Nair, 2000). Pollution results in continues dynamic state of change in the water bodies that upset the dynamic balance of the aquatic ecosystem. A good quality water is essential for all living organisms and the characteristics of water that affect the survival, growth, reproduction etc. is important from the view point of culture of aquatic organisms (Kavita Sahni and Sheela Yadav, 2012).

Limnology plays a very important role in decision making process in aquaculture practices. A change in water quality affects the biotic community of an aquatic ecosystem ultimately reducing the primary productivity (Iwama *et al.*, 2000) have pointed out that several deviated physico chemical factors could act as stresses and adversely affect fish population. In this respect a regular monitoring of water quality is essential to determine the status of water bodies with reference to fish culture.

Fishes are sensitive to the contaminations of water. So, they adversely affected the quality of water in aquaculture ponds (Tidame and Shinde, 2012). This is because they are poikilothermic in nature and live permanently immerse in water so that they are directly affected by the changes in the ambient medium. In this context the present study has been planned to evaluate the physico-chemical characteristics of water of a local pond and to study the possibility of the utilization of the pond water for fish culture by using the fingerlings of the fresh water teleost fish *Oreochromis mossambicus.*

MATERIALS AND METHODS

Study area

The pond under the investigation is a perennial one (Gani Rowthar Pond) situated about 4 kms away from Erode city, Tamil Nadu. It is roughly rectangular in shape (Figure 1) map with an area of about 6.07 acres. It has raised bounds all around with the distribution of marginal rooted vegetation in the surrounding area.

*Corresponding author email: farithahameed@gmail.com

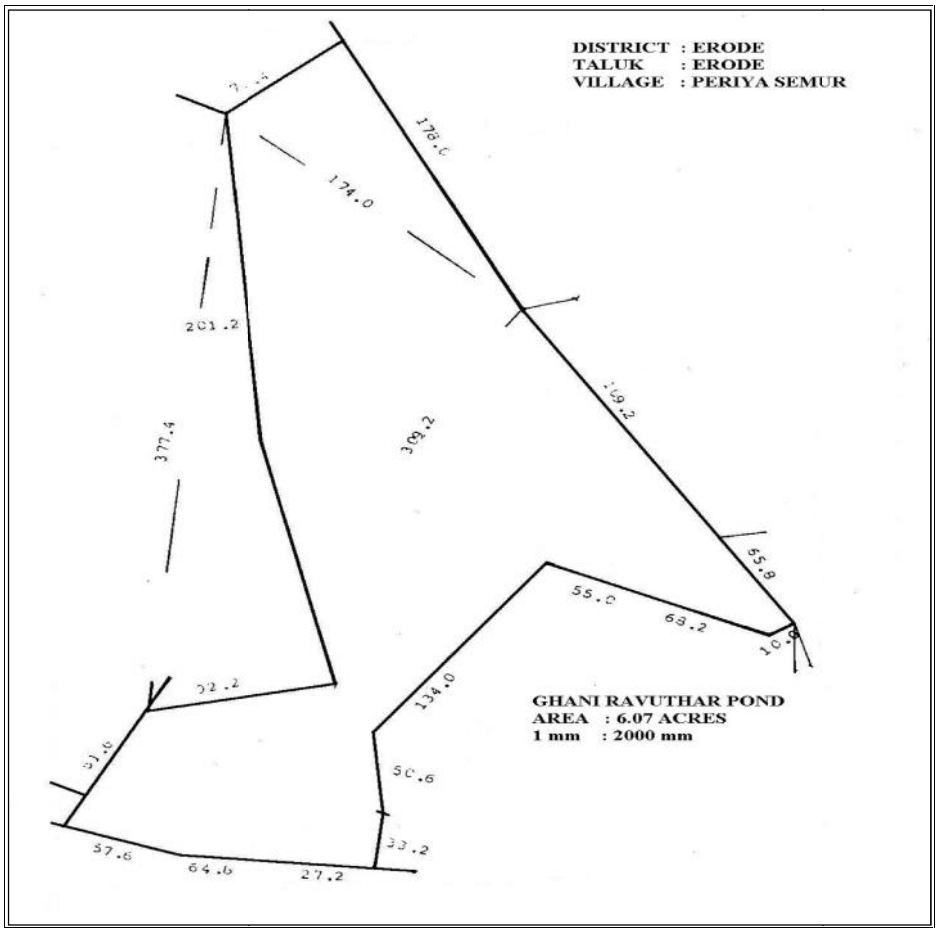

Figure 1. A local perennial pond near Erode city.

Water sample was collected from the pond at a depth of 100 cm in plastic containers. Various physico-chemical parameters of the pond water were estimated by following the standard methods of APHA (2005). Healthy fingerlings of *O. mossambicus* collected from a local reservoir were acclimatized to the laboratory conditions for a week in dechlorinated tap water contained in glass aquaria. Then the acclimatized fishes where introduced into the raw pond water. As the fingerlings died altogether within 5 days the growth studies were carried out by exposing the in fingerlings different concentrations of pond water (10%, 20%, 30%, 40%, 50% and 60%) with dechlorinated tap water as a dilute medium. The fingerlings were kept in experimental media for about 8 weeks and length weight relationships were studied through growth parameters such as length weight growth rate and specific growth rate. The results were subjected to statistical analyses.

RESULTS AND DISCUSSION

Various physicochemical characteristics of the pond water are presented table 1. The pond water is slightly turbid and the total solids are within the tolerable limit given by ISI (1991). However a high quantity of solids indicates the contamination of water by pollutants because the immediate effect of organic pollution is a rise in the concentration of various solids. The higher values of total dissolved solids are associated with increased turbidity due to silt and organic matter as reported by Mohamed (2005). Krishna Ram *et al.* (2009) reported that the dissolved solids reduces the water clarity decreases photosynthesis and increases water temperature. The increased electrical conductivity of the pond water could be due to the enhanced amount of dissolved solids as observed by Krishna Ram *et al.* (2009) and Ehiagbonare and Ogunrinde (2010). In agreement with Kamal *et al.* (2007), the pond water is found to have a PH of 7.4, which is safe to maintain productivity and to rear fish fauna. The pond water exhibits an increased alkalinity which could be due to the mixing of

toxic substances, high evaporation rate and change in alkalinity with increased decomposition as recorded by Yarel (2009).

In the present study the pond water is found to have increased hardness which could be due to mixing of domestic sewage and industrial effluents (Rajagopal *et al.*, 2010). The low dissolved oxygen content of the water in the present study indicates the poor productivity of pond which could be due to mixing of wastes Kavitha Sahini and Sheela Yadav (2012), due to increased decomposition of organic materials. Shinde *et al.* (2010), Shiddamallayya and Pratima (2008), have shown that the higher organic load and increased population of microorganims determined the BOD level in water bodies. But in the present pond study the BOD of water is not too much and is within tolerable limit. However, a continuous monitoring is necessary as the pond water contains a little quantity of oxygen and high carbon dioxide content. In addition the pond water also contains a higher calcium hardness as well as chlorides. This could be due to a high salinity resulted by sewage pollution as shown by Saksena *et al.* (2006).

A higher concentration of sulphates in the present pond water could be due to the production of hydrogen sulphate by anaerobiosis (Harnay *et al.*, 2013). A high quantity of phosphate, the water sample of the pond understudy is an indication of possible pollution load. This corroborates the findings of Kamal *et al.* (2007).

In order to identify the possibility of utilizing the pond water for fish culture the fingerlings of the fish were tested in the laboratory by rearing them in the pond water of various concentrations. The results of length weight relationship of the fingerlings reared in various concentrations of pond water are given in Table 2. The perusal of results indicates that the growth patterns of the fingerlings were slightly deteriorated when they were reared in pond water. The percent change in length and weight as well as growth rate and specific growth rate pertaining to length and weight of the fingerlings slightly vary significantly in growth pattern. These findings are similar to the observation of Hansen *et al.* (2002), Sarnowski (2003), Rowe (2003), Fafioye and Oluajo (2005) and Hayat *et al.* (2007).

From the foregoing account it is clear that the physico-chemical characteristic of the pond water is not significantly contaminated. But little variations have been observed in the quality of water with reference to alkalinity, hardness, O_2 content Co_2 and so on. This could be due to mixing of domestic and industrial wastes vicinity of the pond. The aquatic organisms are generally affected by heavy metals (Rathore and Khangarot, 2003), Alkarkhi *et al.* (2009), the pesticide David (2005), Shah and Devakota (2009) and by soaps and detergents from the sewage Rana and Verma (2005) and Chukwa and Odunzeh (2006).

Table 1. Physicochemical analyses of pond water.

S. No.	Parameters	Results
01	Colour	Slightly turbid
02	Total suspended solids	21.00 mg/l
03	Electrical conductivity	1100 mhos/cm
04	Total dissolved solids	770 mg/l
05	pH	8.20
06	Estimation of Alkalinity	348 mg/l
07	Estimation of Total Hardness	1252 mg/l
08	Estimation of Dissolved Oxygen	1.10 mg/l
09	Estimation of Biochemical oxygen Demand	14.30 mg/l
10	Estimation of Chemical oxygen Demand	76.00 mg/l
11	Estimation of Carbon-di-oxide	30.75 mg/l
12	Estimation of Chlorides	134 mg/l
13	Estimation of Sulphate	252 mg/l
14	Estimation of Phosphate	0.84 mg/l
15	Estimation of Calcium hardness	70 mg/l

Table 2. Length weight relationship of *Oreochromis mossambicus* reared in different concentration of the pond water.

Concen-tration (%)	Change in net loss		Change in growth rate		Change in sgr	
	Length (cm)	Weight (gm)	Length (cm)	Weight (gm)	Length (cm)	Weight (gm)
60	1.63	3.32	0.0024	0.0036	0.0128	0.0231
50	1.48	2.42	0.0022	0.0033	0.0109	0.0228
40	1.53	2.62	0.0022	0.0032	0.0112	0.0218
30	1.61	2.73	0.0023	0.0033	0.0114	0.0229
20	1.49	2.12	0.0023	0.0034	0.0114	0.0201
10	1.42	1.59	0.0021	0.0032	0.0110	0.0116

CONCLUSION

In conclusion it may be pointed out that the quality of the pond water seems to exert some changes of one kind or another resulting in the reduction of growth in the fingerlings. This is because the pond under study, as a greater part of natural environment could be facing great threat due to indiscriminate discharge of toxicants. Therefore there is a need to monitor the pond water to be utilized for aquaculture. In addition it is recommended that the discharge of toxic substances might be properly and strictly controlled and regulated by appropriate measures in order to utilize the pond for the aquaculture practices.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this article.

ACKNOWLEDGMENT

The authors wish to acknowledge the Principal and HOD of Zoology, C.N. College, Erode for the laboratory facilities provided.

REFERENCES

Alkarkhi, A.F., Norly, M., Ahmad, I. and Easa, A.M., 2009. Analysis of heavy metal concentrations in sediments of selected estuaries of Malaysia-a statistical assessment. *Environ. Assess*., 153: 179-185.

APHA, 2005. Standard methods for examination of water and wastewater. 21st Edn., Washington D.C.

Chukwu, L.O. and Odunzeh, C.C., 2006. Relative toxicity of spent lubricantoil and detergent against benthic macro-invertebrates of a West African estuarine lagoon. *J. Environ. Biol.*, 27: 479-484.

David, P., 2005. Environmental and Economic costs of the application of pesticides primarily in the United States. Environ. Develop. *Sustain*.,7: 229-252.

Ehiagbonare, J.E., and Ogunrinde, Y.O., 2010. Full length Research paper- physic-chemical analysis of fish pond water in okada and it's environs, Nigeria. *Afr. J Biotech.*, 9(36): 5922-5928.

Fafioye, O.O. and Oluago, O.A., 2005. Length-weight relationships of five species in Epe Iagoon, Nigeria. *Afr. J. Biotech.*, 4(7): 749-751.

Hansen., A.W., Liptonj, G. and Suedkamp., M.J., 2002. The effects of long-term cadmium exposure on the growth and survival of juvenile bull trout (*Salvelinus confluentus*). *Aquat. Toxicol.*, 58: 165-174.

Harney, N.V., Dhamani, A.A. and Andrew, R.J. 2013. Seasonal variations in the physico-chemical parameters of pindavani pond of central India. *Weekly Sci. Int. Res. J.*, 1(6): 1-8.

Hayat, S., Javed, M. and Razzaq, S., 2007. Growth performance of metal stressed and *Cirrhina mrigala* reared under semi-intensive culture system Pakistan. *Vet. J.*, 27(1): 8-12.

ISI, 1991. Indian Standared for Drinking Water, Bureau of Indian Standard. New Delhi, India, pp.179.

Iwama, G.K., Vijayan, M.M. and Morgan, J.D., 2000. The stress response in fish. Icthyology. In: Recent Recent Research Advances,

Oxford and IBH publishing Company, Pvt. Ltd., New Delhi, pp. 453.

Kamal, D., Khan., A.N., Raham., M.A. Ahamed., A., 2007. Study on physic-chemical properties of water of Mouri River, Khulna, Bangladesh. *Pak. J. Bio. Sci.,* 10(5): 710-717.

Kavita Sahni and Sheela Yadav, 2012. Seasonal variations in physico-chemical parameters of Bharawas pond, Rewari, Haryana. *Asian J. Exp.Sci.,* 26(1): 61-64.

Krishna Ram, H., Ramachandra Mohan, M. and Shivabasavaiah, 2009. Water quality status of fresh water lake (Thallilake), Krishnagiri, Tamilnadu. *Indian J. Environ and Ecoplan.*, 16(1): 103-112.

Mohamed. H.A., 2005. Physico-Chemical characteristics of Abuza' Ball Ponds, Egypt. *Egyp. J. Aquat. Res.,* 31(2): 1-15.

Prasanthan, D. and Vasudevan Nayer, T. 2000. Impact assesment hydrological studies on Parvathyputhen AR. Poll. Res., 19(3): 475-479.

Rajagopal, T., Thangamani A., Sevarkodiayone S.P., Sekar, M., and Archunan, G., 2010: Zooplankton diversity and physico-chemical conditions in three perennial ponds of Virudhunagar district, Tamil Nadu. *J. Environ. Biol.,* 31: 265-272.

Rana, S.V.S and Verma, Y., 2005. Biochemical toxicity of benzene. *J. Environ. Biol.,* 26: 157-168.

Rathore, R.S., and Khangarot, B.S., 2003. Effects of water hardness and metal concentration on a fresh water *Tubifex tubifex* Muller. Water, Air Soil Pollu., 142:341-356.

Rowe, C.L., 2003. Growth responses of an estuarine fish exposed to mixed trace elements in sediments over a full life cycle. *Ecotoxicol. Environ. Saf.,* 54(2): 229-239.

Saksena, D.N., Gaidhanel, D.M. and Singh, H., 2006. Limnology of Kharland (saline) ponds of Ratnagiri, Maharashtra in relation to prawn culture potential. *J. Environ. Biol.,* 27(1): 49-53.

Sarnowski, P., 2003. The effects of metals on yolksac resorption and growth and starved and fed common carp (*Cyprimus carpio* L.) Larvae. *Acta scientiarum Polonorum Piscaria,* 2(1): 227-236.

Shah, B.P. and Devkota, B. 2009. Obsolete pesticides their environmental and human health hazards. *J. Agr. Environ.,* 10: 60-66.

Shinde, S.E., Pathan, T.S., Raut, P.R., More, P.R. and Sonawane, D.L., 2010. Seasonal variation in physic-chemical characteristics of Harsool-Savangi Dam, District Aurangabad, India. *The Ecoscan,* 4(1): 37-44.

Shiddamallayya, N. and Pratima, M., 2008. Impact of domestic sewage on fresh water body. *J. Environ. Biol.,* 29(3): 303-308.

Tidame, S.K. and Shinde, S.S., 2012. Studies on seasonal variations in physico-chemical parameters of the temple pond Nashik District (M.S.), India. *Int. Multidisciplinary Res. J.,* 2(5): 29-32.

Yerel, S., 2009. Investigation of water quality characteristics by using factor and multidimensional scaling analysis in Porsuk River (Turkey). *Asian J. Chem.,* 21(9): 7234-7240.