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Potability of Water in Relation to Some Physico-Chemical Parameters of Mudugodu Pond, Chikkamagalur, Karnataka, India

H. A. SAYESWARA[1*], K. L. NAIK[1], NAFEESA BEGUM[2] AND H. M. ASHASHREE[1]

[1]Department of Zoology, [2]Department of Botany Sahyadri Science College (Autonomous)
Kuvempu University, Shivamogga 577203, Karnataka, India
E-mail : sayesh2009@gmail.com
**Correspondence*

Abstract

About 13 physico-chemical parameters of Mudugodu pond in Chikkamagalur district of Karnataka were recorded during January 2009 to December 2009. The results of physico-chemical analysis revealed that water is polluted as is possesses high BOD and free CO_2. Conclusively these parameters along with other physico-chemical characteristics were found to be largely affected by surface run-off and excessive human activities.

Key words : Mundugodu pond, Physico-chemical parameters, Potability of water.

Water is an essential compound for all living beings including humans. Mudugodu pond is an annual water body as it receives the water from the adjacent paddy fields, Bhadra canal and waste water from Mudugodu village. Physico-chemical parameters play a vital role in determining the distributional pattern and quantitative abundance of organisms inhabiting a particular aquatic ecosystem (1). A number of workers have studied the potability of lentic water bodies (2, 3). The total area of Mudugodu pond is about 75 acres of which water spreads over an area of 52 acres with average depth of 2.13 m. It is located in Tarikere taluk of Chikkamagalur district at Mudugodu village. The water is used for domestic purpose like washing of clothes, vehicles, domestic animals. The physico-chemical characteristics of pond water have direct impact on prevailing organisms as well as human being using such water (4). The literature revealed that there is no scientific study carried out with respect to ecological characteristics of this pond. Thus with this background it was proposed to explore a scientific study on physico-chemical characteristics of mudugodu pond.

Methods

The study was carried out during the period from January 2009 to december 2009. During the study period , the surface water samples were collected in clean plastic cans between 0900 to 1000 hours once a month. Water temperature was recorded on the spot. The samples for dissolved oxygen fixed immediately on the field itself. The remaining parameters were analyzed the following standard methods (5).

Results and Discussion

The results of physico-chemical parameters of Mudugodu pond water are given in Table 1.

Temperature plays a vital role in either increasing or decreasing a particular chemical factor or set of factors in water bodies. The water temperature is influenced by factors such as altitude, season, time and depth of water. Values of water temperature ranged from 22.5 to 26.2 C. The minimum value was recorded in March and maximum in August. The pH is a term used to express the intensity of acidic or alkaline condition of a solution. Acidic condition increases as pH value decreases and alkaline condition increases as pH value increases. Alkaline waters are generally more common than acid waters. Leaching of soil, decomposition of organic matter and discharge of industrial effluents cause the acidity in water bodies (6). The pH represented little variation as it ranged from 6.1 to 7.2. The maximum value was recorded in June and minimum in April.

Table 1. Physico-chemical characteristics of Mudugodu pond. All values in mg/l, except temperature.

Parameters	Months 2009											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature	25.3	22.8	22.5	24.1	24.3	25.2	25	26.2	26.1	27	25.1	26
pH	6.7	6.2	6.2	6.1	6.7	7.2	7	6.7	7.1	6.8	6.8	7.1
DO	7.31	7.95	8.10	9.15	7.90	8.25	8	8.20	8.35	7.9	8.31	8.7
BOD	6.6	7.35	8.0	7.25	6.5	6.8	7	7.15	6.95	6.8	8.45	6.9
Free CO_2	9.3	9.9	11.2	13.2	10.3	12.7	14	9.9	12.4	9.8	11.2	9.9
Alkalinity	53.5	60	55	43	38.5	40.3	35	48	39.2	49	49.7	57
TH	53	60	48	61	57	44	52	45	43	50	52	58
Calcium	17	20	18	21	14	17	10	16	11	14	15	19
Magnesium	35	39	29	37	40	26	41	27	30	33	35	37
Chlorides	65	60	72	82	66	58	69	73	67	81	61	72
Nitrates	5.3	6.2	7.2	5.7	6.2	5.4	7	6.9	6.3	5.9	6.7	7.1
Phosphates	1.2	1.9	1.4	1.3	1.6	1.6	2	1.7	1.3	1.1	1.6	1.7
Sulfates	9.2	8.3	7.9	7.4	10.2	9.2	8	7.2	10.4	9.7	10.1	7.7

Dissolved oxygen is an important gaseous factor that determines the quality of water and intern regulates the distribution of aquatic organisms. In the present study the DO level fluctuated between 7.31 to 9.15 mg/liter. The highest and the lowest values were recorded in April and January, respectively. The variations of DO depend on the primary production and respiration of aquatic organisms. The permissible standard of DO is above 5 mg/liter (7). BOD is the measure of degradable organic matter present in water. BOD and other microbial activities generally increase by the introduction of sewage (8). In the present study BOD values ranged between 6.5 to 8.45 mg/liter. The minimum value was noticed in May while maximum in November. They were found above the permissible limit of 6.5 mg/liter.

Free carbon dioxide values fluctuated between 9.3 to 14 mg/liter. The highest and the lowest values were recorded in July and Junuary, respectively. The variation of CO_2 was due to the absorption by plants for photosynthesis and activity of other living organisms. Alkalinity in the water samples is primarily a function of carbonate, bicarbonate and hydroxide content. In the present study total alkalinity ranged from 35 mg/liter (July) to 60mg/liter (February). It is within permissible limit of 600 mg/liter. Surface alkalinity may result from the discharge of domestic wastes. Total hardness of water is not a pollution parameter but indicates water quality mainly in terms of Ca^{2+} and Mg^{2+} contents. Total hardness values observed are 43 to 61 mg/liter. The minimum value was recorded in September and maximum in April. Calcium and magnesium concentrations are observed to be in the range of 11 to 21 mg/liter and 26 to 41 mg/liter respectively. Total hardness above 200 mg/liter is not suitable for domestic use in washing and cleaning.

Chloride is an important anion found in variable amounts in water bodies.The chloride content normally increases as the mineral content increases. Chlorides increase the degree of eutrophication (9). In the present study, chloride values fluctuated between 58 mg/liter (June) to 82 mg/liter (April). High chloride content indicates the deterioration of water quality usually linked with sewage load (10). The most important sources of chlorides in the fresh water are the discharge of domestic sewage and farm drainage. The concentration of chlorides is thus the indicator of pollution (11).

Phosphorus occurs in natural water as various types of phosphates. The most important sources of phosphates are the discharge of domestic sewage, detergents and agricultural runoff. Values of phosphates ranged from 1.1 to 2.0 mg/liter with the minimum value in October and maximum in July. Most of the unpolluted sources of water are deficient of nitrates because it exists only in few natural sources (12). Biological oxidation of organic nitrogenous substances present in domestic and industrial sewage and nitrifying bacteria add nitrates to water body (11). In the present study, nitrate values ranged from 5.3 to 7.2 mg/liter. The minimum value of nitrate was noticed in january while maximum in March. sulfate is one of the Major onions occurring in natural waters. It may

enter natural waters through weathering of sulfate bearing deposits. The values fluctuated between 7.2 to 10.4 mg/liter. The minimum value was recorded in August and maximum is September.

The water samples from Mudugodu pond was collected and analyzed for various physico-chemical parameters to study the extent of pollution. The pond is partially covered by different aquatic plants like *Typha, Pistia, Azolla.* This is due to increase in nutrients level in the pond through agricultural runoff from adjacent areas. The results of physico-chemical analysis has revealed that the Mudugode pond is contaminated due to human disturbances. In the light of standard of water quality recommended by WHO, the pond water should not be used by human beings especially for drinking and cooking. It is recommended that the domestic wastes has to be properly treated before discharged into the pond. The anthropogenic activities should be prevented by organizing awareness programs.

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