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Assessment of Water Quality of Madikoppa Pond, Dharwad Taluk and District, India

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Abstract

The aim of this study was assess the extent of pollution status of Madikoppa pond Dharwad taluk, Dharwad district due to agricultural run-off and man-made activities. Analysis of water with respect to physico-chemical parameters was conducted from June 2006 to June 2007. Physico-chemicals parameters which were analyzed showed the potability of water and are within the desirable limits except for some parameters.

Key words : Pond, Potable, Physico-chemical parameters, Pollution, Desirable limits.

Water the monoxide of hydrogen is colorless liquid and has a high dielectric constant. Because of this property salts get highly ionized when dissolved in water and thus water is known as universal solvent. Natural water, therefore, contains many salts in dissolved form.Biologists consider water as a medium of life (1). Unpolluted and pure water is odorless, tasteless and colorless liquid. It is estimated that two-thirds of the human body is constituted of water (2). Although more than 70% of the earth's surface is composed of aquatic ecosystems, hardly 1% of the global water is available to man for use. A vast country like India has a large number such ecosystems which, unfortunately, are not properly exploited (3). Although many limnological work were carried out in North-Karnataka, our knowledge of limnology is considered to be meager. Hence, an attempt was made to assess the physico-chemical parameters of Madikoppa pond, Dharwad taluk, Dharwad district, Karnataka.

Methods

Madikoppa pond is situated at $15^0 31' 18'' N$ and $74^0 51\ 08'' E$ at an altitude of 655 MSL covering an area about 5.2 acres. The above said pond is in Dharwad taluk of Dharwar district. This is one of the biggest tank coming under minor irrigation project of Dharwad district. It is approximately 10—15 years old pond, artificially built for irrigation and for domestic use. Since that time no ecological work has been carried out on this pond. Hence, an attempt was made to assess the physico-chemical parameters was carried out. Jawar and sugarcane are the chief crops usually grown near the pond. Monthly water samples were collected from June 2006 to June 2007. Water samples were collected from different places of Madikoppa pond, in labeled plastic container of five litre capacity using composite sampling method. Sampling was done in early hours of the fixed day. The physico-chemical parameters were analyzed (4, 5). Temperatures was noted down on the spot and remaining factors were analyzed in the laboratory without lapse of much time.

Results and Discussion

Physico-chemical parameters observed from the pond water from June 2006 to June 2007 are given in Table 1 together with the permissible and desirable limits according to IS 10500-1991. This pond water is mainly used for domestic and irrigation purpose. There was foul smell in late summer (6).

Temperature

Water temperature was almost similar throughout the year from 25 to 26 C. Steady changes in the seasons results in the corresponding changes in water temperature. Large number of ecological processes in fresh water bodies is influenced by temperature.

Table 1. Physico-chemical parameters of Madikoppa pond of Dharwad. Desirable limits (acceptable) max as per IS 10500-1991. Permissible limits (max) as per IS 10500-1991.

Date	Parameters							
	Water temp	pH	Cond	Tur	TH	Ca	Mg	Cl
2006								
19 Jun	25.0	7.6	22	72	120	21.2	16.2	29
19 Jul	25.2	8.8	12	38	81	15.9	10.1	12
19 Aug	25.5	7.8	15.2	85	93	18.9	11	22
19 Sep	25.5	7.6	15.2	116	126	22.9	16.79	48
19 Oct	25.4	7.7	22	70	94	16.6	10.90	24
19 Nov	25.0	7.8	22	56	89	20.5	9.10	25
19 Dec	25.0	7.2	23	39	100	20.4	11.91	23
2007								
19 Jan	25.2	7.1	11	04	61	16.5	4.8	12
19 Feb	25.5	7.1	30	20	101	22.9	10.55	25
19 Mar	25.8	6.9	33	05	101	15	15.3	11
19 Apr	26.0	7.6	34	19	105	22.9	11.5	31
19 May	25.9	7.7	32	30	103	20.9	11	32
19 Jun	25.5	7.8	30	58.6	105	22.9	11.5	33
Desirable limits		0.7-8.5	—	5	300	75	30	200
Permissible limits		6.5-8.5	—	10	600	200	75	1000

Table 1. Continued.

Date	Parameter							
	SO_4	F	NO_3	Fe	PO_4	Alk	DO	CO_1
2006								
19 Jun	12	0.1	1	0.3	0.1	80	7.2	04
19 Jul	11	Nil	2	0.4	0.2	81	8.8	04
19 Aug	10	0.1	2	0.3	0.3	64	8.1	12
19 Sep	11	0.1	2	0.3	0.09	88	8.3	05
19 Oct	10	0.1	1	0.3	0.15	70	7.4	03
19 Nov	11	0.1	2	0.4	0.24	74	8.2	04
19 Dec	09	0.1	2	0.3	0.12	78	8.5	08
2007								
19 Jan	12	0.3	1.2	0.1	0.3	50	7.2	05
19 Feb	14	0.1	1	0.1	0.27	72	7.9	01
19 Mar	17	0.1	0.8	0.1	0.3	75	8.3	04
19 Apr	14	0.3	2.8	0.3	0.26	84	7.3	03
19 May	10	0.1	1.5	0.1	0.2	82	7.5	02
19 Jun	07	0.2	0.5	0.3	0.3	80	7.9	Nil
Desirable Limits	200	1	45	0.1	—	200	—	—
Permissible limits	400	1.5	100	1.0	—	600	—	—

pH

The pH values of the pond during study period ranged between 6.9 and 8.8. The pH is considered as an indicator of overall productivity that causes habitat diversity (7). Slightly alkaline conditions are favorable for the growth of primary producers. The variations of pH values during the study period showed no remarkable significance, which may be due to total absence of carbonates. Comparatively highest values was noticed in monsoon and lowest in summer.

Conductivity

Electric conductivity is an important factor where it directly tells about the dissolved ion present in water. During study period the electric conductivity ranged between 11—34 μs/cm. The electric conductivity recorded is more in summer season than in winter season, this could be due to the dumping of waste from the clay-mining activity surrounding the pond.

Turbidity

Turbidity is caused due to wide variety of suspended solids, organic colloidal compounds and coarse dispersion of sewage (8, 9). Since turbidity reduced the light penetration, high rate of phytoplankton production is restricted only to upper waters. The turbidity levels in the present study ranged from 04 NTU and 116 NTU. The turbidity level is incressed in winter season and lower in summer season so there is no definite pattern as such.

Total Hardness

Hardness of water is mainly due to bicarbonates, carbonates and chlorides of calcium and magnesium (2). The hardness content of pond varied from 61 and 126 mg/liter Comparatively the higher value was observed during summer and lower value in monsoon.

Calcium and Magnesium

Calcium is an important element influencing flora of ecosystem, which plays an important role in metabolism and growth. During study period calcium content of pond varied from 15 and 22.9 mg/liter. Normally, these ions are not problematic but at higher concentration increases total hardness of water (10). Calcium is one of the alkaline earth metal and it is not known to indicate or produce any hazardous effect on human health (11).

Magnesium content of pond during study period varied from 4.8 and 16.79 mg/liter. The maximum content of calcium and magnesium is observed during summer and winter seasons (12).

Chloride

During study period the chloride content of pond varied from 11 to 48 mg/liter. Higher concentration of chlorides in water is an index of pollution. Usually natural waters contains low chlorides however, high concentration of chlorides in water was found in connection with Na (13). The increasing values of chloride in summer season may be due to a gradual decrease in the amount of water Choursia and Adoni (14) also made a similar observation in their studies with summer maxima and winter minima.

Sulfates

During study period the sulfates content of pond varied from 7 and 17 mg/liter. During study period sulphate ranged maximum value in summer and minimum value in rainy season. Domestic sewage and agricultural runoff are the chief sources of sulfates.

Fluoride

During study period the fluoride content of pond varied from nil and 0.2 mg/liter. The main sources of fluoride in water are different bearing rocks. The observed values are within the permissible limits for drinking water.

Nitrite

During the study period the nitrite content of pond varied from 0.5 to 2.8 mg/liter. Domestic sewage, agricultural run off, metabolic wastes of aquatic community and dead organisms are chief sources of this parameter. Low values of this parameter may be due to the insufficiency in the system to iodize biologically the ammonia to increase the nitrate level (15). High concentration of this parameter in water is an indicator of pollution.

Iron

During study period the iron content of pond varied from 0.1 to 0.4 mg/liter. Presence of iron in considerable amount in water imparts color and also develops turbidity, when exposed to air, consequently the water becomes unacceptable for drinking purpose. In three seasonal values were found below the maximum permissible limits for drinking water.

Phosphate

During study period, the phosphate content of

pond varied from 0.9 to 0.3 mg/liter. Atmospheric deposition, agricultural practices import from livestock, atmospheric N_2 fixation and sewage are the main sources of nitrogen and phosphorus influx to a watercourse (16). Phosphates occur as orthophosphates, condensed phosphates and naturally found phosphates. Their presence in water is due to detergents, from used boiler water, fertilizers and due to biological processes. They occur as detritus in the bodies of aquatic organisms. Inorganic phosphorus plays a dynamic role in aquatic ecosystems and it is one of the most important nutrients when present in low concentrations but in excess along with nitrated and potassium cause algal biooms (17).

Alkalinity

A number of bases viz., carbonates, bicarbonates, hydroxides phosphates, nitrates, silicates, borates contribute to alkalinity. During study period the alkalinity of pond varied from 50 to 88 mg/liter. In the present study alkalinity showed monthly variations and it remained low during winter season.

Dissolved Oxygen

During study period the dissolved oxygen content of pond water varied from 7.2 to 8.8 mg/liter. Oxygen is an index of the physical and biological processes going on in water. It is moderately soluble in water and its solubility decreases with increase in temperature (18). In present study dissolved oxygen gradually increased from September to January. The gradual increase in DO during winter was also reported by (15, 19, 20).

Carbon Dioxide

Carbon dioxide is produced as a result of respiration of aquatic organisms. The carbon dioxide content of pond varied from Nil to 12 mg/liter. The absence of free CO_2 indicates the total utilization for photosynthetic activity (21, 22).

Conclusion

Thus several physico-chemical parameters of water quality of Madikoppa pond that several parameters pH, conductivity, total hardness, calcium and magnesium, chloride, sulfates, fluoride, nitrate, iron, phosphates, dissolved oxygen, carbon dioxide, alkalinity showed monthly variations but did not follow, the seasonal pattern and thereby indicated that factors other than seasonal climatic changes, like domestic use, man-made activities, aquatic habitats might also contribute for monthly variations. Except turbidity all other parameters are within in the permissible limits of IS 10500 1991. Based on these observations pond water is not polluted.

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