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MONTHLY VARIATIONS OF PHYSICO-CHEMICAL PARAMETERS OF KHANAPUR TANK, SHAHPUR, YADGIR DISTRICT, KARNATAKA.



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ABSTRACT

The present work is an attempt to assess the physico-chemical parameters of Khanapur Tank, Shahpur Taluk, Yadgir District. The study was carried out for a period of one year from February 2014 to January 2015. The main aim of the study was to determine the suitability of the water for human consumption and other domestic uses. Monthly variations at five different sampling stations I, II, III, IV and V of the Khanapur Tank were observed.

Monthly variation in Total rainfall, Atmospheric and Water temperature, Total dissolved solids, pH, Dissolved oxygen, Free carbon dioxide, Total alkalinity, Total hardness, Calcium, Magnesium, Chloride, Phosphate and Biochemical oxygen demand were observed. The results reveals that the condition of this tank in different months during the study period shows fluctuations in the physico-chemical parameters and showed pollution status of this tank.

KEYWORDS :Physico-chemical parameters, Khanapur Tank, Monthly variations.

INTRODUCTION

Water is one of the abundantly available substance in nature, Which man has exploited more than any other resources for the sustenance of life. Good quality of water is required for living organisms. The study of different water parameters is very important for understanding of the metabolic events in aquatic ecosystem. Freshwater ecosystems are considered as one of the most

important natural resources for the survivability of all the living organisms of the biosphere. Freshwater becomes a critical natural resource due to number of reasons[1-2]. The increasing demands of freshwater is in all sectors like drinking, agriculture, aquaculture and industrial. Freshwater is going to the scarcest resource in the 21st century and it is said that the next world war will be due to the water[3-5].

Analysis of physico-chemical parameters of water is essential to assess the quality of water for the best usage like irrigation, drinking, bathing, fishing, industrial processing and so on. Water is a driving force for all developmental activities and all life depend on it. It is of great importance for people and environment[6]. Water is the essence of life on the earth and totally dominates the chemical composition of all organisms. Water is essential for the survival of human beings, animals and plants[7-8].

MATERIALS AND METHODS

Khanapur is one of the Village in Shahapur Taluk in Yadgir District in Karnataka State. Khanapur Tank is a perennial fresh water body. It lies between 77.13 OE Longitude and 16.77 ON Latitude. Its water spread area is 110.3738 hectares. The Water of this water body too is used mainly for agriculture. In addition to this, its water is also used for washing clothes, bathing animals and other domestic activities.

The water samples for physico-chemical parameters were collected from Khanapur Tank, Shahpur Taluk, Yadgir District, Karnataka, at five different sites viz Station1, Station2, Station 3, Station 4 and Station 5, morning between 8 am to 11 am in the first week of every month from February 2012 to January 2013. The samples were collected in acid washed five liter plastic container from a depth of 5-10 cms below the surface of water. The physico-chemical characteristics of the tank were determined on monthly basis according to standard methods APHA (1998); Trivedi and Goal (1987) [8-10].

RESULTS AND DISCUSSION

The monthly variations of physico-chemical parameters data of Khanapur Tank, Shahpur Taluk, Yadgir District, Karnataka have been presented in Table 1.

Physico-chemical Characteristics

Temperature: Temperature is one of the physical parameter, which is directly related with chemical reaction in the water and biochemical reaction in the living organisms. In the present investigation atmospheric and water temperatures followed more or less similar trend of oscillation.

The overall mean atmospheric and water temperature were 31.84 °C and 21.10 °C. The maximum atmospheric and water temperature in the month of May was 41.72 °C and 26.9 °C and the minimum atmospheric and water temperature in the month of January was 24.96 °C and 19.05 °C. The water temperature was consistently lower than atmospheric temperature[11].

Total Dissolved Solids: Solids refer to suspended and dissolved matter in water. Dissolved solids are an important parameter in drinking water. High concentration of total dissolved solids increase water turbidity this in turn decreases the light penetration, thus effects the photosynthesis.

The overall mean total dissolved solids were 209.15 mg/L. The maximum total dissolved solids was 326.96 mg/L and the minimum total dissolved solids was 94.6 mg/L. High values of solids were found due to mixing runoff rain water which carried mud, sand etc mixed in the tank water.

Hydrogen-ion-concentration: pH is defined as the intensity of the acidic or basic character of a solution at a given temperature. pH is the negative logarithm of hydrogen ion concentration.

The overall mean hydrogen-ion-concentration were 8.0. The maximum hydrogen-ion-concentration was 8.6 and the minimum hydrogen-ion-concentration was 6.94. The hydrogen ion concentration of fresh water varies considerably depending upon factors like concentration of carbon dioxide, carbonate and bicarbonate in water.

Dissolved oxygen: Dissolved oxygen is an important parameter in water quality assessment. Its presence in water is essential for aquatic life. All the organisms require oxygen for the maintenance of the life.

The overall mean dissolved oxygen were 6.59 mg/L. The maximum dissolved oxygen was 8.66 mg/L and the minimum dissolved oxygen was 4.4 mg/L.

Free carbon dioxide: Carbon dioxide plays an important role in the life of micro-organisms and plants and thus regarded as one of the essential components of the aquatic ecosystem. Excess amount of carbon dioxide is dangerous to animal kingdom.

The overall mean free cabondioxide were 4.72 mg/L. The maximum free carbondioxide was 5.28 mg/L and the minimum free carbondioxide was 3.48 mg/L.

Total alkalinity: The total alkalinity of water is a measure of its capacity to neutralize acids. The alkalinity of natural water is due to salts, carbonates, bicarbonates, borates, silicates and phosphates along with the hydroxyl ions in the free state.

The overall mean total alkalinity were 201.88 mg/L. The maximum total alkalinity was 177.2 mg/L and the minimum total alkalinity was 129.4 mg/L.

Total Hardness: Hardness of water is due to presence of divalent metallic cations like Ca^{+2} , Mg^{+2} , ferrous ion and manganese. Hardness is due to concentration of alkaline earth metals, Ca^{++} and Mg^{++} ions are the principle cations importing hardness, it prevents formation of leather. The increase in hardness can be attributed to the decrease in water volume and increase in the rate of evaporation at high temperature.

The overall mean total hardness were 80.09 mg/L. The maximum total hardness was 109.94 mg/L and the minimum total hardness was 43.82mg/L.

Calcium: Calcium is the essential nutrient for animal life and is found in abundance in all natural waters. Calcium in an aquatic environment is an important macronutrient. The range of calcium in the water is largely dependent on the solubility of calcium carbonate, sulphates and rarely fluorides. The calcium content may range from 0-105 mg/L depending upon their source of water.

The overall mean calcium were 63.04 mg/L. The maximum calcium was 104.22 mg/L and the minimum calcium was 41.56 mg/L.

Magnesium: Magnesium is the important source of the water. It generally occurs in concentration lower than those of calcium. Magnesium is a necessary constituent of chlorophyll.

The overall mean magnesium were 24.84 mg/L. The maximum magnesium was 28.34 mg/L and the minimum magnesium was 22.98 mg/L.

Chloride: Chloride anion is generally present in natural waters. The chloride concentration is higher in organic wastes and its higher level in natural water is definite indication of pollution from domestic sewage.

The overall mean chloride were 39.33 mg/L. The maximum chloride was 45.56 mg/L and the minimum calcium was 29.48 mg/L.

Phosphates: Presence of phosphates in water and the analysis of that water have a great significance. The presence of phosphates in large quantities in fresh water indicates pollution through sewage and industrial waters. It promotes growth of nuisance causing microorganisms. Phosphorous is an essential element for all living organisms. It is nutrient for plant growth and a fundamental element in the metabolic reactions of plants and animals. It controls the algal growth and primary productivity.

The overall mean phosphates were 0.537 mg/L. The maximum phosphates was 0.708 mg/L and the minimum phosphates was 0.342 mg/L.

Biochemical Oxygen Demand (BOD): The role of Biochemical oxygen demand in water bodies and its importance in aquatic productivity is well recognized. As a factor abiotic occupies a highly important place in aquatic ecosystem.

The overall mean biochemical oxygen demand were mg/L. The maximum biochemical oxygen demand was 21.38 mg/L and the minimum biochemical oxygen demand was 8.0 mg/L.

CONCLUSIONS

The present study show detailed physico-chemical characteristics in Khanapur tank, Shahpur taluk, Yadgir District, Karnataka.

- + The atmospheric and water temperature followed a seasonal trend and varied at different times of a day and different months of the year. The temperature fluctuation in water was influenced considerably by air temperature, humidity, winds and solar radiation.
- + The total dissolved solids were within the permissible limits of drinking standards. High concentration of total dissolved solids increases water turbidity, this in turn decreases the light penetration, thus effects the photosynthesis.
- + The higher concentration of hydrogen-ion-concentration was observed during summer season could be attributed to enhanced rate of evaporation coupled with human interference are partly to enhanced photosynthetic activity. The pH was generally alkaline in this tank.
- + The higher values of dissolved oxygen during summer season, which may be due to increased solar radiation.
- + The free carbon dioxide was considerably more during monsoon season. It is interesting to note that the increased trend of free carbon dioxide values coupled with decreasing trend of total alkalinity.
- + The total alkalinity, total hardness, calcium and magnesium showed seasonal variations and this tank water is moderate hard water conditions, which in turn useful for the higher productivity.
- + Phosphate plays a very important role as a nutrient budget of the tank, which influences the phytoplankton production, abundance of zooplankton and nutritional values of aquatic organisms in the tank.
- + Biochemical oxygen demand was higher during northeast monsoon season and summer season. However, the biochemical oxygen demand values were within the permissible limits.

**Table 1. Monthly variations in physico-chemical parameters of Khanapur Tank
(During February 2012 to January 2013)**

	February 2012	March	April	May	June	July	August	Sept.	October	November	December 2012	January 2013
Atoms Temp (°C)	30.08	38.9	40.74	41.72	37.24	31.36	29.22	27.68	27.58	26.58	26.08	24.96
Water Temp (°C)	20.75	21.77	23.3	26.9	21.72	20.77	20.82	20.5	19.25	19.25	19.15	19.05
TDS (mg/L)	290.8	229.76	227.22	294.22	257.76	243.56	326.96	122.78	94.6	94.8	148.8	169.6
pH	8.4	8.66	8.4	6.94	7.14	8.24	8.16	8.38	7.7	7.46	8.26	8.3
DO (mg/L)	6.96	7.48	8.66	8.36	6.8	6.14	4.84	4.4	6.58	6.3	5.98	7.04
CO ₂ (mg/L)	5.26	4.04	3.48	3.56	4.8	4.62	4.32	3.7	4.38	4.28	5.18	6.04
Alkalinity (mg/L)	177.2	145.8	129.4	175.2	164	148.2	166.4	155.4	129.8	132.2	138.4	160.6
Hardness (mg/L)	84.84	95.22	106.96	74.3	78.44	73.38	79.98	109.94	43.82	68.06	78.1	68.06
Calcium (mg/L)	41.56	71.6	104.22	80.24	64.54	53.72	57.84	56.4	72.46	52.56	49.04	52.32
Magnesium (mg/L)	26.68	28.34	24.68	24.68	22.98	24.08	26.72	23.82	23.66	24.56	24.62	23.25
Chloride (mg/L)	43.64	43.18	44.3	45.56	37.06	44.24	43.66	42.04	32.4	30.4	29.48	36.1
Phosphate (mg/L)	0.496	0.496	0.342	0.38	0.452	0.52	0.636	0.558	0.604	0.658	0.708	0.642
BOD (mg/L)	9.16	8.4	8	9.18	13.4	13.12	13.32	10.18	17.24	18.82	19.3	21.38

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