COMPARATIVE STUDIES ON THE PHYSICO-CHEMICAL PARAMETERS OF DANTARAMAKKIAND HIREMAGALURU POND WATER IN CHIKMAGALUR.

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Abstract: The present study aimed at the assessment of water quality of Dantaramakki, and Hiremagaluru Ponds water in Chikmagalur. The study was conducted to measure various physico-chemical parameters like temperature, pH, electrical conductivity, free carbon dioxide, chloride, total dissolved solids, dissolved oxygen, total alkalinity, total hardness and radon. The investigation revealed that there is a mesotrophic status of the studied pond and hence, preventive measures are required to avoid further deterioration of the pond water quality. The estimated water quality parameters were compared with the WHO and BIS standards.

Index Terms - Physico-Chemical Parameters, Dantaramakki Pond, Hiremagaluru pond.

I. INTRODUCTION

Water is the foremost requirement of for the assistance of life on this earth. It serves as habitat for large number of aquatic organisms of various sizes i.e., from microscopic plankton to large aquatic animals and plants. water bodies like ponds and streams are posing a serious threat due to addition of various organic and inorganic constituents (Gandotra, R Et.al., 2017). In addition, Water contamination with pathogens and pollutants create many health problems for the consuming the water. As such water quality in relation to human health is an important fact of limnology, even though ecological interrelationship, species diversity and physico-chemical properties of ponds have received considerable attention (Kishore Gujjar and Kiran, 2017). Moving water dilutes and decomposes pollutants more rapidly than standing water but many ponds and streams are significantly polluted all around the world. A primary reason for this is that of all three major sources of pollution (industry, agriculture and domestic) are concentrated along the rivers. Industries and cities have been located along the rivers because the rivers provide transportation and convenient place to discharge waste (Sunkad, 2013). A perusal of available literature has revealed that there is no scientific study carried out with respect to ecological characteristics of this ponds (Banerjee, 1967; Sayeswara et al., 2010). Hence, the present investigation is carried out in relation to physico-chemical characteristics of water in Dantaramakki and Hiremagaluru Ponds water in Chikmagalur.

Materials and Methods:

Study Area:

The present investigation be carried out to assess the status of the water in Dantaramakki and Hiremagalur ponds of Chikmagalur district. The study area is located at 13°19'N latitude and 75°46'E longitude and 13°18'N latitude and 75°48'E longitude. The pond water which was selected for study are used for agriculture and partly for domestic activities.

Methods:

Water temperature and pH were recorded at the sampling spot itself and the estimation of other physico-chemical parameters like, DO (Dissolved oxygen), free CO_2, hardness, alkalinity, chlorides as given by the standard procedures (Trivedy and Goel, 1986; APHA, 1998). Temperature was determined using the mercury thermometer while, pH was measured by a digital pH meter. Samples for dissolved oxygen demand were sampled with a 250mL dark colored reagent bottles. These water samples were fixed at site by Winkler's solution ($MnSO_4$, H_2O). All samples were then taken to laboratory for further determination. DO was then determined on the fixed sample by titration. Alkalinity was determined by titration procedure where a known volume of water samples was titrated with 0.02M HCl. Total hardness of water was measured by titrating 0.01N ethylene diamine tetra acetic acid (EDTA) using Eriochrome Black-T indicator. Chloride was determined by titration procedure where a known volume of water samples was titrated with 0.014N of $AgNO_3$. Free CO_2 in water samples was determined using 0.1N Na_2CO_3. (Basavaraj Simpi et al, 2011).

Fig 1: A view of Dantaramakki and Hiremagalur Pond

Result and discussion

Average Physico-Chemical Parameters of Dantaramakki and Hiremagalur Pond:

The average water temperature of the pond was 22°C and water shows alkaline in nature. The total hardness and chloride of the water were 94.85 mg/l and 75.5 mg/l respectively. Average values of Dissolved oxygen recorded with 5.84 mg/l and Free CO_2 values 7.28 mg/l. Total alkalinity of Hiremagalur pond showed 150.31 mg/l. Different analytical water quality parameters with their analytical technique and guideline values as per WHO, EPA and Indian standard are presented in Table 1.

Figure 2 and 3 shows an depicts the water quality of Dantaramakki and Hiremagalur pond at station I and II respectively. The water temperature of Hiremagalur pond varied from 22°C to 26°C. In an established

system the water temperature controls the rate of all chemical reactions, and affects organisms' growth, reproduction and immunity. Drastic temperature changes can be fatal to aquatic organisms (Patil et al., 2012). pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity (Gupta et al.,2009). The reduced rate of photosynthetic activity, the assimilation of carbon dioxide and bicarbonates are ultimately responsible for increase in pH. Various factors bring about changes the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical conditions (Karanth 1987). During the present study, pH values fluctuated from 7.0 to 7.9. The average pH values of different water bodies indicate alkaline nature throughout the study period.

Carbon dioxide is the end product of organic carbon degradation in almost all aquatic environments and its variation is often a measure of net ecosystem metabolism (Smith & Hollisbaugh, 1997, 1993, Hopkinson 1985). Therefore, in aquatic biogeochemical studies, it is desirable to measure parameters that define the carbon dioxide system. CO_2 is also the most important greenhouse gas on Earth. Its fluxes across the air-water or sediment-water interface are among the most important concerns in global change studies and are often a measure of the net ecosystem production/metabolism of the aquatic system (Patil et al., 2012). In this study, free CO_2 values fluctuated from 1.93 to 12.18 mg/l respectively.

a stabilizer for pH. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple diluted hydrochloric acid titration in presence of phenolphthalein and methyl orange indicators. Alkalinity in boiler water essentially results from the presence of hydroxyl and carbonate ions. Hydroxyl alkalinity (causticity) in boiler water is necessary to protect the boiler against corrosion. Too high a causticity causes other operating problems, such as foaming. Excessively high causticity levels can result in a type of caustic attack of the boiler called "embrittlement" (Patil et al., 2012). The total alkalinity of Dantamakki and Hiremagalur pond ranged from 124 to 198 mg/l. The above results clearly indicate that the water body in the present study was found to be less productive.

Dissolved Oxygen (DO) is one of the most important parameters. Its correlation with water body gives direct and indirect information e.g., bacterial activity, photosynthesis, availability of nutrients, stratification etc. (Premlata Vikal, 2009; Patil et al., 2012). In the progress of summer, dissolved oxygen decreased due to increase in temperature and also due to increased microbial activity (Moss 1972, Morrissette 1978, Sangu 1987, Kataria et al., 1996). From the above data the higher DO values of Dantaramakki and Hiremagalur Pond (3.8mg/l to 7.5mg/l) may be due to presence of biotic components (i.e., aquatic plant) releasing oxygen and it may be due to in higher interference of atmosphere air with the aquatic bodies.

Chloride is measured by titrating against standardized silver nitrate solution using potassium chromate solution in water or eosin solution and alcohol as indicator. The latter indicator is an adsorption indicator while the former makes a red colored compound with silver as soon as the chlorides are precipitated from solution (Patil et al., 2012). In the current study, the chloride of Dantaramakki and Hiremagalur

Pond is found to be from 38mg/l to132mg/l. Levels less than10 mg/l are desirable. Levels more than 250 mg/l may cause a salty taste.

Total Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both (Trivedy and Goel, 1986). The total hardness of Dantramakki and Hiremagalur pond water ranged in between 81mg/l & 128mg/l indicating the water is moderately hard.

Total Dissolved Solids (TDS) refer to suspended and dissolved matter in water. They are very useful parameter describing the chemical constituents of the water and can be considered as general of edaphically relation that contributes to productivity within the water body (Goher, 2002). In the present study, TDS values ranged from 174 to 310 mg/l. From Table 3 as per TDS values it is observed that the pond water belongs to good class category (160 – 480).

Many studies have been done in our country to assess the quality of pond water but very few of them have studied the assessment of physico-chemical parameters of ponds receiving domestic waste (Kanungo et al., 2006; Sayeswara et al., 2010). In general, such characteristics are largely affected by human activities and influx of domestic waste in pond water, which cause a greater degree of eutrophication (Kaur et al., 1996; Sayeswara et al., 2010). The information of physico-chemical parameters under study exhibits that the pond water is not eutrophicated. In the light of standard of water quality recommended by WHO and Indian standard, the pond water should be used by the human beings especially for drinking and cooking after water treatment. Pond water is also fit for aquaculture and irrigation.

recommended by WHO and Indian standard, the stream water should be used by the human beings especially for drinking and cooking after water treatment. Pond water is fit for aquaculture and irrigation.

Conclusion:

All the physico-chemical parameters investigated during present study were in the desirable limits prescribed by except chloride and alkalinity. The slight fluctuating water quality values obtained in this study showed that pond water is fit for aquaculture. Our present study gives knowledge about management of pond for various requirements. To improve quality of water, there should be continuous monitoring of water in Hiremagalur pond of Chikmagalur, Karnataka.

Table 1: Drinking water quality standards as given by WHO & BIS standards

Parameter	Permissible limit	
	WHO, 1994	BIS (BIS 10500:1991)
Colour, Hazen unit, max	Nil	5.0
Turbidity, NTU	5.0	5.0
Dissolved solids	500	500
Total hardness	100	300
Calcium hardness	75	75
Magnesium hardness	30	30
Alkalinity	200	200
Dissolved oxygen	4-6	4-6
Chloride	250	250
Nitrate	45	45
Iron	0.3	0.3
pH	6.5-8.5	-
BOD	5	-
Potassium	12	-

Table 2: Water quality of Dantaramakki and Hiremagalur ponds during the study period

Area	Station I							
Month	September							
	Dantaramakki				Hiremagalur			
Week	I	II	III	IV	I	II	III	IV
Temp	24	25	23	24	23	23	22	22
pH	7.0	7.2	7.2	7.3	7.2	7.2	7.3	7.3
EC µmhos/cm	160.7	148.2	159.1	200.5	220.2	190.5	208.4	182.7
TH	123	137	139	141	145	145	147	149
Chloride	135	95	88	96	99	103	112	120
DO	7.6	7.4	6.5	5.8	6.6	6.9	6.9	7.1
CO_2	3.52	7.0	64.48	15.6	17	36	19	29
Total Alk.	14.6	15.6	48	53	65	78	64	49
TDS	180	184	190	198	194	224	280	290
Area	Station II							
Temp. (^{O}C)	23	23	24	22	23	23	24	23
pH	7.3	7.9	7.5	7.5	7.6	7.6	7.5	7.5

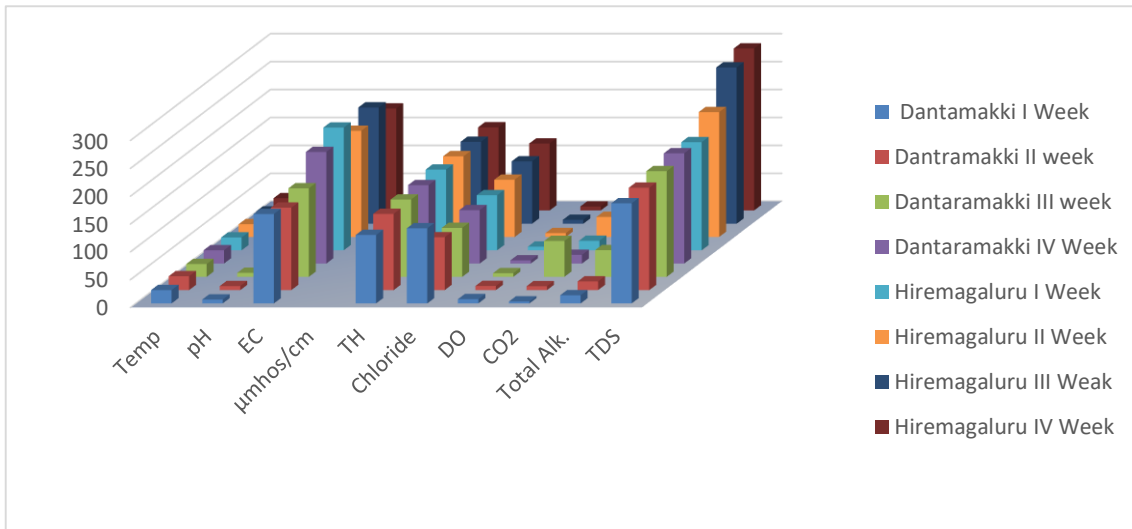| EC μmhos/cm	190	250	199	148	145	200.8	220.4	206.6
TH	157	127	135	140	141	149	150	155
Chloride	145	93	87	93	101	109	112	113
DO	7.2	7.6	8.2	7.9	7.3	6.8	7.1	7.1
CO_2	7.04	3.52	54.56	30.1	19	20.6	15.9	7.6
Total Alk.	13	17	25	48	56	60	51	38
TDS	190	210	215	240	290	310	320	360

Figure 2: Water quality of Dantrammki and Hiremagaluru pond at station I
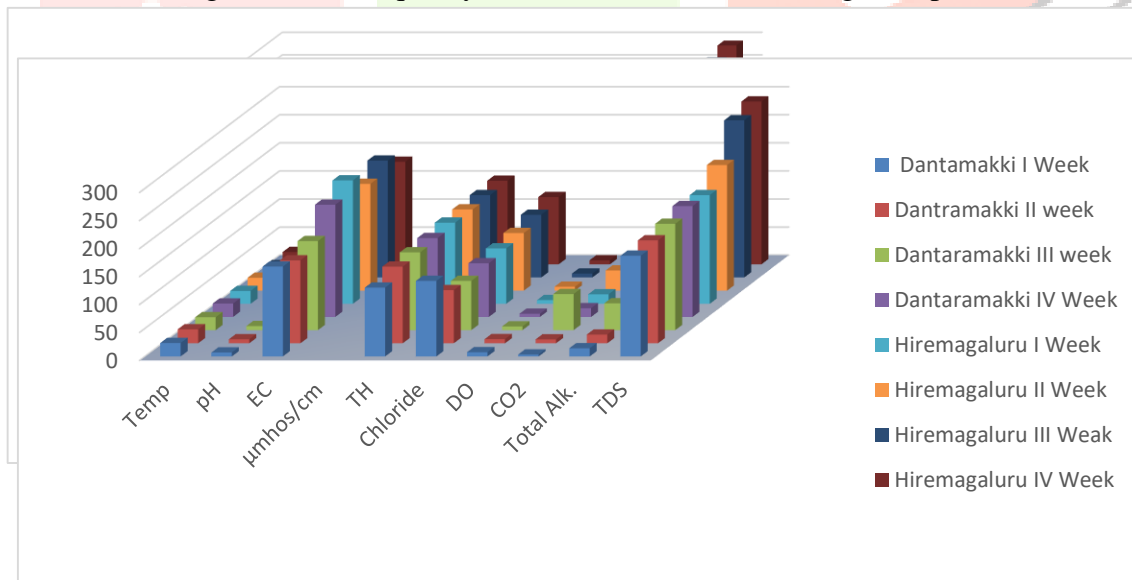

Figure 3: Water quality of Dantrammki and Hiremagaluru pond at station II

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