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Limnological Study of Hasmathpet Lake Situated in Hyderabad Region of Telangana

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Abstract **-Indiscriminate and wasteful water consumption and improper waste disposal practices have led to deterioration in the water quality be it surface or ground water. Hasmathpet lake is an urban surface water body situated at a distance of kms from Hyderabad. People use this water for domestic and agricultural purposes. Due to the immersion of Ganesh idols and Durga idols, this lake is getting polluted to a large extent. This study throws highlight on the pollution potential of the lake water quality.**

The present study deals with the assessment of physico-chemical characteristics of Hasmathpet lake, so as to predict the pollution status of the lake. The physico-chemical characteristics of this lake has been studied and analyzed for a year, i.e., from during March 2013 to February 2014. Water samples were collected from four stations throughout the lake. The following parameters were analysed: Water temperature, pH, Turbidity, Total dissolved solids, Alkalinity, Total dissolved solids, Biochemical oxygen demand and Chemical oxygen Demand. Seasonal variations of sampling sites of the lakes have been observed. Various parameters including, pH, water temperature, turbidity, chlorides, Alkalinity, Hardness, Dissolved Oxygen, Biochemical Oxygen Demand and Chemical Oxygen Demand has been analysed .The study reviled that the lake water showed high turbidity values in rainy season. Further, chlorides and hardness was shown to be little higher than the Indian standards(BIS) . Still thevalues of chlorides were present within permissible limits. Dissolved oxygen was very less in summer season and Biochemical oxygen Demand was high at all stations during the observed period. Though Chemical Oxygen Demand was observed to be little high, it was present within acceptable limits.

All these conditions clearly states that the lake is loaded with organic pollutants and is in the verge of Eutrophication.

Keywords: Limnological Study, physico-chemical characteristics, pollution, Lake water.

I. 1.INTRODUCTION

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is dependenent on the physico-chemical and biological characteristics (Venkatesharaju etal ,2010). The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics. Any characteristic of water that affects the survival, reproduction, growth and production of aquaculture species, influences management decisions, causes environmental impacts or reduces product quality and safety can be considered a water quality variable.Limnology and water quality provide current information about the concentration of various solutes at a given place and time. Water quality parameters in specific, provide the basis for judging the suitability of water for its designated uses and to improve existing conditions.

To assess that monitoring of these parameters is essential to identify magnitude and source of any pollution load. These characteristics can identify certain conditions for the uses of water for agriculture and several other purposes, which in turn suggest appropriate conservation and management strategies. Many researches are being carried out till present (Rajesh et al 2002, Jayaraman et al ., 2003; Sharma & Gupta 2004; Rajasekar et al., 2005; Sridhar et al., 2006; Anilakurmar et al., 2007; Prabu et al., 2008; Raja et al., 2008; janaradhan et al., 2009; Srivastava et., 2009; Damotharan et al., 2010; Prasanna and Ranjan, 2010). In order to assess water quality of Hasmathpet lake, physicochemical analysis of lake water has been attempted .The aim of the study is to rule out the pollution status of lakes in terms of physico-chemical characteristics of water, which calls for best management strategies to reduce pollution .

However, very little information is available in relation to physico-chemical characteristics of water in this lake. Hence, the preset study was conducted to study the physico-chemical properties of water of three lakes for a period of one year from March 2013 to February 2014.

2.MATERIALS AND METHODS:

2.1 STUDY AREA:

Hasmathpet has an awesome Tank Bund called as HASMATH CHERUVU which is the one of the famous lakes in Hyderabad and Secunderabad (Fig:I). This Lake is connected from Alwal Lake to Hasmathpet and occupies a large space in this area. People from different parts of this area come for a festival which as known as Ganesh Chaturthi for immersing their idols in this Lake. Every year, the lake water is clogged with ganesh idols and durga idols that have been immersed as per tradition. GHMC has cleared about 10 tonnes of debris from Hasmathpet lake alone in October 2013, owing to the heavy immersion of idols. People of hasmathpet villege use this water form bathing and domestic purposes, as well as irrigation purposes.

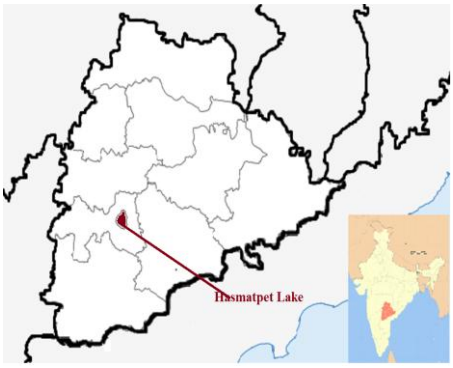


FIGURE 1: MAP OF THE STUDY AREA

FIGURE2:MAPSHOWING SAMPLING SITE

2.2 COLLECTION OF SAMPLES:

To study water quality status of the lakes, water samples were collected from 4 different points to cover the whole lake water. The study was carried out for a period of one year . Water samples were taken 4 times .in a year .i.e, in the month of March, June, September and November for Analysis.

Some of the results were recorded at the sampling stations whereas the others were recorded in the laboratory, according APHA, 2005,Kodarkar et al., 2008 & BIS.

3. RESULTS AND DISCUSSION:

RESULTS:

values of physico-chemical parameters are presented in Table's-1 - 8 and and seasonal variation is shown in figure's1 to 8.

3.1 WATER TEMPERATURE

Temperature of Hasmathpet lake water ranged from 24.75°C to 28.5°C in different seasons (Figure-1). High seasonal variations were observed at all the sites. Water Temperature was high due to low water level, high air temperature and clean atmosphere.

3.2 pH

pH range of 6.5 to 8.5 is normally accepted as per guideline suggested by WHO .During present study, water pH values of Hasmathpet lake water were found around 6.99 to 7.9. (Tables1 to 4) at all stations. Lowest value of 6.99 was recorded at station- I , and highest value of 7.99 was recorded at station's 2,3 & 4 . It is indicating slightly alkaline nature throughout the study period (Fig:2) . Slightly higher values of pH were found in summer season at all stations. The high values may be due to attributed sewage discharged by surrounding city and agricultural fields. pH value is very important for plankton growth (Chisty, 2002). According to Umavathi et al .,(2007) pH in the range of 5 to 8.5 is best for phytoplankton growth.

3.3 Turbidity

In the present study, water turbidity values ranged from 0.5 to 10.5 NTU (Table's 1-4). High turbidity values were found in rainy season at all stations.(Fig:3). The results supported by Dagaonkar and Saksena (1992) and Garg et al ., (2006b) have also reported high turbidity during rainy season. During rainy season silt, clay and other suspended particles contribute to high turbidity values, while during winter and summer seasons settlement of silt, clay results low turbidity.

3.4 Total Dissolved Solids

Total dissolved solids is an important parameter in drinking water quality standard. It develops a particular taste to the water and at higher concentration and reduces its palatability .Water with more than 500mg/l TDS usually has a disagreeably strong taste. High TDS levels generally indicate hard water, which can cause scale build up in pipes, valves and filters. Values of Total dissolved solids in the present study ranged from 261.25 to 269.05 ppm in different seasons (Figure), which are above WHO permissible limits. Similar findings have been reported by Rao et al 2003, Kirubavathy et al., 2005, Garg et al., 2006b. TDS analysis has great implications in the control of biological and physical waste water treatment processes.

3.5 ALKALINITY

Alkalinity is a measure of the buffering capacity (ability to resist changes in pH) of the water, and since pH has a direct effect on organisms as well as an indirect effect on the toxicity of certain other pollutants in the water, the buffering capacity is important to water quality. Commonly occurring materials in water that increase alkalinity are carbonates, bicarbonates, phosphates and hydroxides. The Alkalinity of Hasmathpet waters ranged from highest value of 24.0 ppm during rainy season to the lowest value of 18 ppm during spring season(Figure-4) .Alkalinity was found to be highest at all stations in rainy season.

3.6 Chlorides

Chloride were found to be high during the entire period of study . Chlorides at different stations ranged from 36.39 ppm to 40.44 ppm (Figure-5). The highest value of 39.64 ppm was found during winter season. Similar results were reported by Swarnalatha and Nasing rao (1998) and Umavathi et al., (2007) . Higher concentration of chloride is association with increased level of pollution.

3.7 Total hardness

In the present study, total hardness ranged from 165.5 ppm to 196.00 ppm in different seasons (Figure-6). These high values may be due to the addition of calcium and magnesium salts. The increase in hardness can be attributed to the decrease in water volume and increase in the rate of evaporation at high temperature. High values were recorded in summer season at all stations. Hujare (2008) reported that total hardness was high during summer than rainy season and winter season.

3.8 Dissolved oxygen

Dissolved oxygen is an important aquatic parameter, whose presence is vital to aquatic fauna. It plays crucial role in life processes of animals. In the present study the DO values found to be in the range of 4.2 ppm during rainy season(Station-2) to 6.5 ppm during spring season (Station-I). Rani et al., (2004) reported lower values of Dissolved oxygen in summer season due to higher rate of decomposition of organic matter and limited flow of water in low holding environment due to high temperature. In the present study, lowervalues of Dissolved Oxygen in rainy season at station-2 may be due to dumping of garbage etc., by villagers living nearby. WHO recommends the Dissolved Oxygen values of 4.6 to 6.0 mg/lit.

3.9 Biochemical oxygen demand (BOD)

Biological oxygen Demand (BOD) is an important parameter to the oxygen required to degradation of organic matter. During the whole study period, BOD recorded from 4.65 to 5.975 mg/l which is within the permissible range (Figure-8) . Devaraju et al ., (2005) has made similar observations in Maddur Lake and Garg et al., 2010 has also made similar observations in Ramsagar reservoir. High BOD value is unflavoured with zooplankton.

3.10 Chemical Oxygen Demand (COD)

Chemical oxygen demand (COD) is a measure of the capacity of water to consume oxygen during the decomposition of organic matter and the oxidation of inorganic chemicals such as ammonia and nitrite. COD measurements are commonly made on samples of waste waters or of natural waters contaminated by domestic or industrial wastes. The COD values in the present investigation ranged between 220 to 250 ppm throughout the study period(Figure-9)

Table 1: Table Showing Physico-chemical characteristics of water collected from Hasmathpet Lake during March-2014 to February - 2014 at Station-1

Sl.No.	Physico-Chemical parameters	Summer season (March-may)	Rainy season (June-Aug)	Winter season (Sep-Nov)	Spring season (Dec-Feb)
1	Temperature0C	28.5	26.8	24.75	27.20
2	pH	6.99	7.0	6.99	7.11
3	Turbidity(NTU)	0	9	0.8	0.5
4	Alkalinity(ppm)	19	21	20	18
5	Chlorides(ppm)	36.39	38.42	38.00	37.34
6	Hardness(ppm)	195	166	175.8	186.5
7	Dissolved Oxygen(ppm)	4.6	5.8	5.0	6.5
8	Biochemical Oxygen Demand(ppm)	3.22	2.15	2.6	3.0
9	Chemical Oxygen Demand(ppm)	246	239	238.5	248.0

Table 2: Table Showing Physico-chemical characteristics of water collected from Hasmathpet Lake during March-2014 to February - 2014 at Station-2

Sl.No.	Physico-Chemical parameters	Summer season (March-may)	Rainy season (June-Aug)	Winter season (Sep-Nov)	Spring season (Dec-Feb)
1	Temperature0C	28.23	26.23	24.95	24.75
2	pH	7.92	7.9	6.99	7.10
3	Turbidity(NTU)	0	8.5	0.3	0.2
4	Alkalinity(ppm)	20	24	20	18.5
5	Chlorides(ppm)	37.89	37.42	38.00	36.45
6	Hardness(ppm)	191.2	165	167.8	180.5
7	Dissolved oxygen(ppm)	4.3	4.2	5.0	6.1
8	Biochemical Oxygen Demand(ppm)	3.12	3.2	2.5	3.0
9	Chemical Oxygen Demand(ppm)	250	239	238.5	248.0

Table 3: Table Showing Physico-chemical characteristics of water collected from Hasmathpet Lake during March-2014 to February - 2014 at Station-3

Sl.No.	Physico-Chemical parameters	Summer season (March-may)	Rainy season (June-Aug)	Winter season (Sep-Nov)	Spring season (Dec-Feb)
1	Temperature0C	28.23	25.23	24.65	24.95
2	pH	7.99	6.8	6.99	7.00
3	Turbidity(NTU)	0	8.5	0.3	0.2
4	Alkalinity(ppm)	21.22	23.5	20	18.7
5	Chlorides(ppm)	36.45	37.42	39.64	35.555
6	Hardness(ppm)	195.2	186.1	167	192.5
7	Dissolved oxygen(ppm)	4.2	5.8	4.8	6.3
8	Biochemical Oxygen Demand(ppm)	3.42	2.7	2.5	2.9
9	Chemical Oxygen Demand(ppm)	248	242	229.5	246.0

Table 4: Table Showing Physico-chemical characteristics of water collected from Hasmathpet Lake during March-2014 to February - 2014 at Station-4

Sl.No.	Physico-Chemical parameters	Summer season (March-may)	Rainy season (June-Aug)	Winter season (Sep-Nov)	Spring season (Dec-Feb)
1	Temperature0C	27.9	26.23	25.66	24.95
2	pH	7.99	6.8	6.99	7.00
3	Turbidity(NTU)	0	9.2	0.2	0.1
4	Alkalinity(ppm)	21.22	23.5	20	18.7
5	Chlorides(ppm)	36.45	38.42	37.54	35.55
6	Hardness(ppm)	195	186.5	165	187.7
7	Dissolved oxygen(ppm)	4.0	6.2	5.0	6.4
8	Biochemical Oxygen Demand(ppm)	3.12	2.9	2.8	3.44
9	Chemical Oxygen Demand(ppm)	246.6	228	230.6	248.0

Figure-1 Graph showing variations in Values of Temparature at different stations.

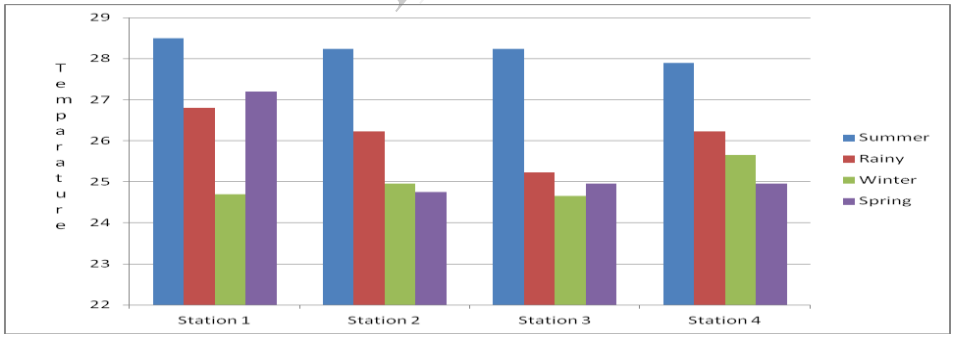


Figure-2 Graph showing variations in Values of pH at different stations.

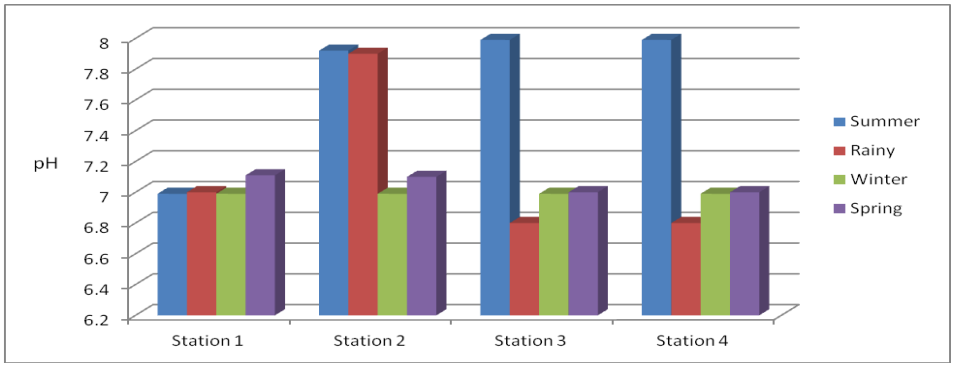


Figure-3 Graph showing variations in Values of Turbidity at different stations.

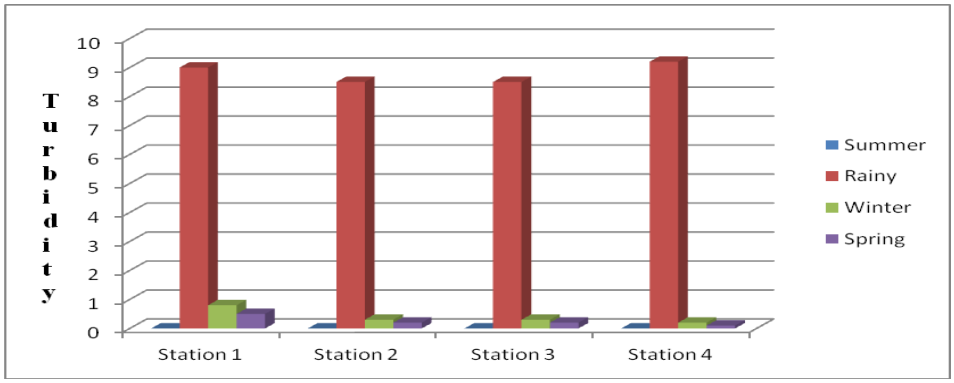


Figure-4 Graph showing variations in Values of Alkalinity at different stations.

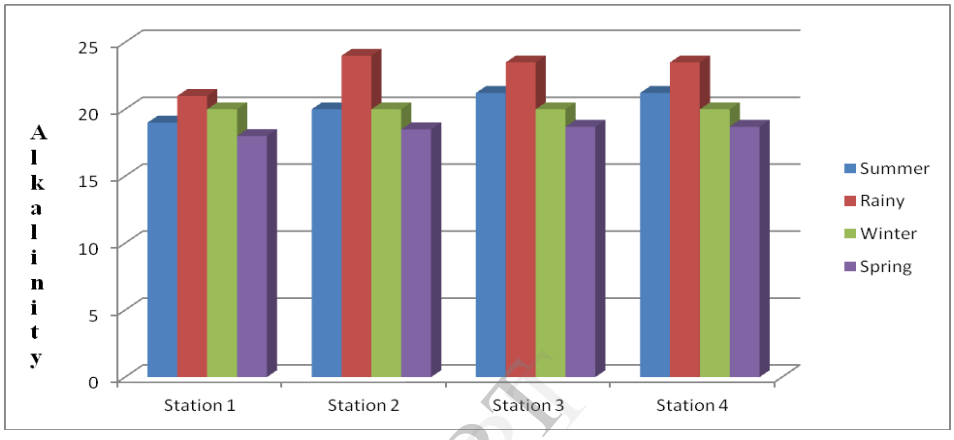


Figure-5 Graph showing variations in Values of Chlorides at different stations.

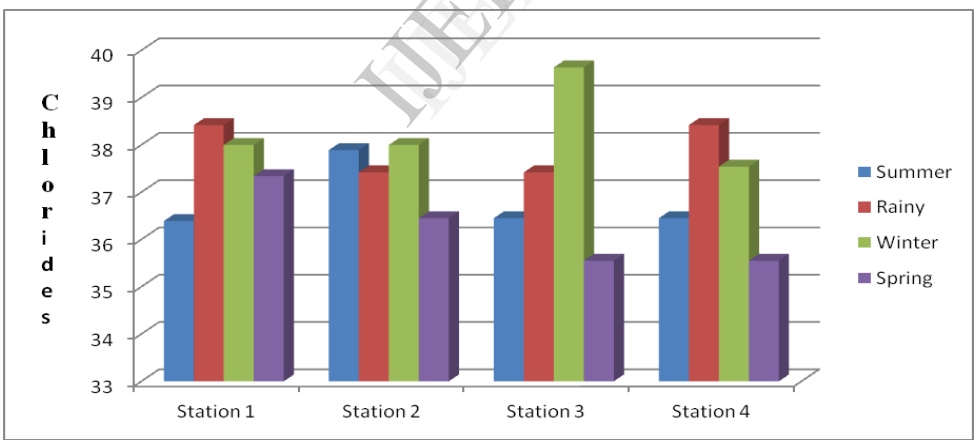


Figure-6 Graph showing variations in Values of Hardness at different stations.

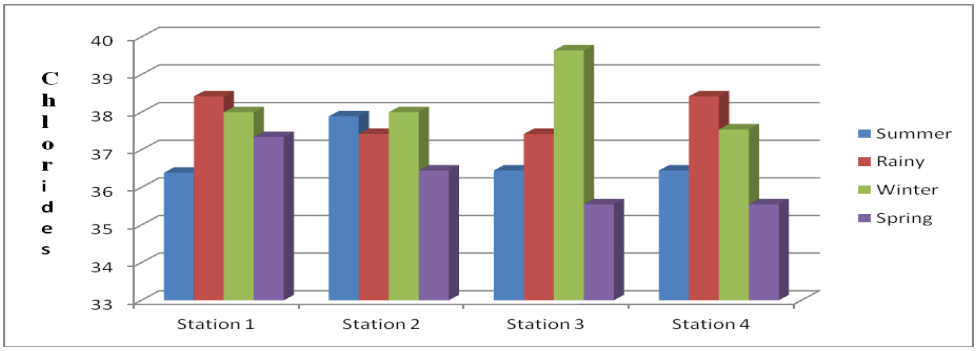


Figure-7 Graph showing variations in Values of Dissolved Oxygen at different stations.

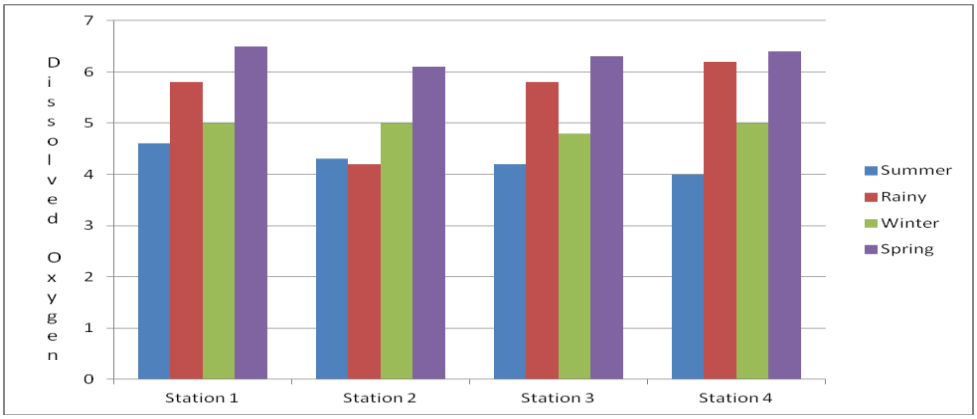


Figure-8 Graph showing variations in Values of Biochemical Oxygen Demand at different stations.

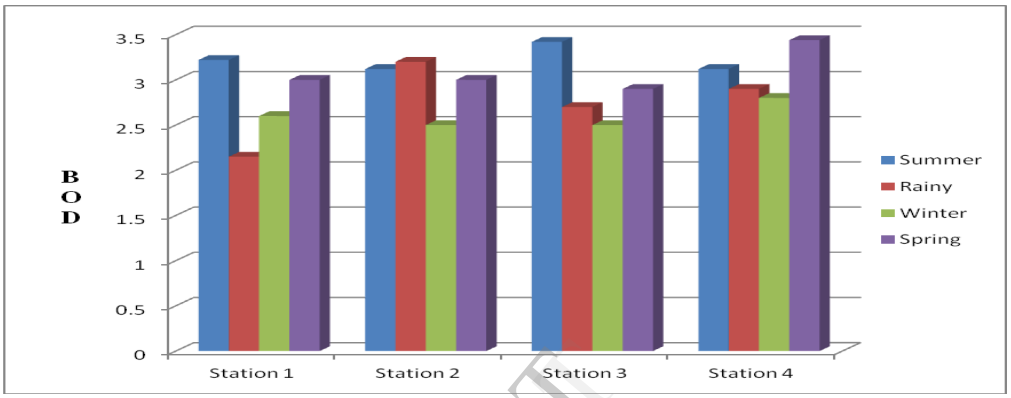
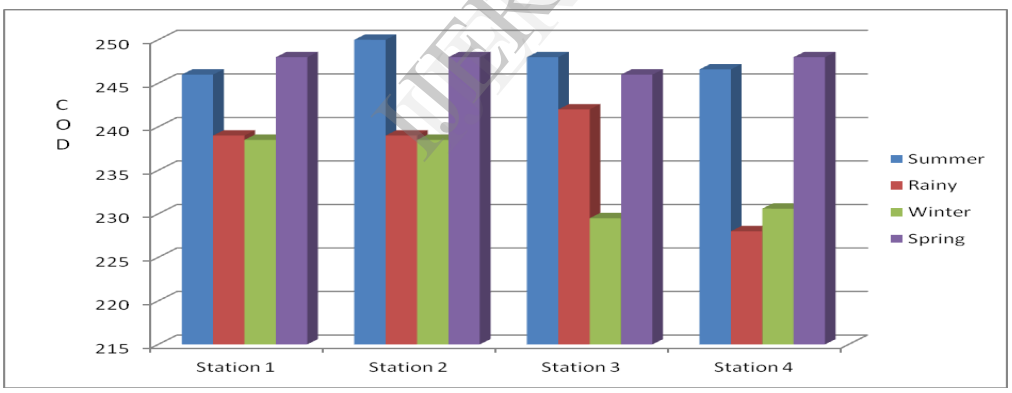


Figure-9 Graph showing variations in Values of Chemical Oxygen Demand at different stations.



DISCUSSION:

Water quality depends upon the type and amount of pollutant added. Hasmathpetlake is a small lake which is situated on the outskirts of Hyderabad city. People living here depend upon the water for irrigation and domestic purposes. This lake is surrounded on all sides by plants and large growth of phytoplankton and water hyacinth . No-a-days,the lake is facing problems due to pressure on its ecosystem by environmental deterioration caused by deposition of various types of wates . Apart from this, Immersion of ganesh idols has also become a part of this , which brings lot of pollutants into the water body. The situation becomes very difficult, if the present problem is unnoticed. Hence , timely monitoring of lakes has become very much essential to suggest best management practices for maintaining the satisfactory level of water quality.

The water quality of the lake has been assessed in terms of physical and chemical parameters. There was a lot of difference in turbidity as it is clearly seen. Seasonal fluctuations in hardness, chlorides, BOD and COD was also noticed,but all the parameters were present within permissible limits.

The results obtained from the present investigation shall be useful in future management of the reservoir.

4.CONCLUSION:

All the physical and chemical properties of Hasmathpet lake water were within desirable limits. Lot of fluctuation were seen in all the parameters. Turbidity was very less in summer season, showing that the water was very clear. All the parameters were present within permissible limits throughout the lake.Seasonal differences may be due to the Immersion of Ganesh idols at the time of

festival season.High value of chlorides in winter season may be attributed to the addition of pollutants .Chemical Oxygen Demand was high throughout the lake indicating Organic pollution.

The results obtained clearly suggests that the hasmathpet lake water consits of Organic pollutants and the lake is in the verge of Eutrophication. If the same situation persists to continue in future, then there is a possibility of the lake for converting into a Eutrophic lake water body.

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