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Analysis of Natural Drainage Water in Udupi

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Abstract

Water quality is relative and its characteristic influences the suitability for a specific use. Drainage water is not different from any water supply since it's always usable for some purpose within certain quality ranges. Drainage water that flows over or through the soil will pick up a variety of dissolved and suspended substances including salts and organic compounds. Management for safe re-use and disposal requires an understanding of the characteristics of the drainage water, and a matching of those characteristics to the environmental protection needs of the re-use or disposal area. Water samples for Physio-Chemical analysis are collected from 21 non point sources. The drainage system extends from Indrahali temple to Malpe beach. The analysis were done for the parameters such as pH, Conductivity, Total Dissolved Solids, Turbidity, BOD, COD, MPN, Chlorides, and Hardness. The results indicates that for certain points chlorides and hardness are exceeding the permissible limit due to domestic waste disposed to the drainage system. Due to disposal of waste water from STP which is located near the Drainage system, BOD and COD values are also high.

Keywords: BOD, Chlorides, COD, Drainage, Hardness

1. Introduction

Udupi is a temple town with an annual rainfall of 4000mm. River Swarna is the major west flowing in Dhakshina Karnataka states which originates from Western Ghats and joins at Kameshwara village in Udupi taluk. The river flows for a length of 61.05 km. There is a need of securing the additional water resources in the district, e.g. re-use of drainage water for Agriculture and Gardening. Among various Drainage System, Kalsanka Drainage System is mainly observed in this paper. This Drainage System originates from Indrani and ends at Malpe with a length of 14 km. This drainage system is a natural drainage system which is built for storm water runoff. Due to Anthropogenic activities this drainage system has been polluted to a major extend. And so there is a need of analyzing this drainage system, since the drainage system ends to Malpe beach. The main source of waste dumped in to this drainage system is domestic waste. And so the organic content in this drainage system is more which in turn increases oxygen demand. Result states that BOD, COD, Chlorides and Hardness are exceeding at certain places.

(M. Xiao et al.) concluded that the controlled drainage mode can effectively reduce drainage times and increase the rainfall utilization efficiency. In 2012, the CTD mode included only one drainage but the CVD mode included five times of drainage. The total drainage volume in CTD was 6.60mm, which was far less than that in CVD.

(Othman et al.) results of the Chemical and Microbiological analyses are related to the permissible levels of FAO, WHO and Mediterranean Countries.The canal water is generally acceptable for Irrigation. However, special concern is not directed towards microbial load (fecal coliforms) but the chemical contents of total salts (EC), Na and K, as well as the trace elements Cd and Fe. The potability of water is disputable along the first 30km,in view of its higher load of Total Bacteria, and Total and Fecal Coliforms. This is in addition to the chemical content of total salts, Na, Fe and Cd. Our results clearly indicate the urgent need for effective strategies for the

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treatment of the drainage water resources before mixing with the Nile Water.

A Mohamed concluded that the chemical analyses of El-Salam Canal Irrigation Water showed that the water from the chemical analyses view permissible for plants in all seasons of the year because the highest value of ElSalam Canal Irrigation Water recorded (1.6 dSm-1)=1024 ppm(mgl-1) approximately. Sodium Adsorption Ratio (SAR) values of El-Salam Canal water at any recoding time followed Class 1, Low Sodium Hazards, use for Sodium Sensitive Crops. But, the drainage water at any recording medium and high and very high sodium hazard for plants.

Nikos et al., (2003) stated that the Electrical Conductivity (EC) is good estimator of the total amounts of mineral salts that dissolved in water. Itis often used to measure salinity problems related to irrigation of crops and it is known that soils irrigated with saline water will contain a similar mix but usually at a higher concentration than in the applied water.

2. Materials and Methdology

2.1 Study Area

The Udupi town (Figure 1.) receives an annual rainfall of 4000mm. Kalsanka drainage system originates from Indrali and ends at Malpe with a stetch of 14km in Udupi town. River Swarna is the main water resource in Udupi. Udupi district is essentially an agriculture district with more than 80% of population depends on agriculture for their livelihood whereas only 40% of the available land is used for agriculture. Rest is either forest land or land unsuitable for agriculture.

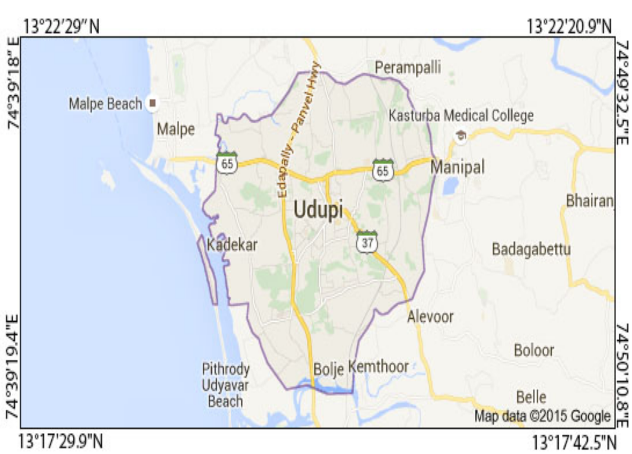

Figure 1. Shows the study area which is Udupi District.

This drainage system is a natural drainage system. Since this drainage is mainly designed for storm water runoff the flow is seasonal. The water in this drainage system is very less in summer season and since the flow is less. At certain places the water is stagnant. But during monsoon the flow is more with sufficient depth of water. Due to exceedingly use of this drainage system for the disposal of waste, the drainage system has been polluted to a major extend. In addition to this Anthropogenic Activities, the disposal of the treated water from sewage water treatment plant which is located near to this drainage system is adding more pollutants to this drainage system.

2.2 Sampling Points and Sampling Method

The samples are collected from 21 points (Figure 2.) including the point where the drainage water meets Malpe beach. It is then stored in refrigerator at 4°C and analyzed. Then the samples were analyzed for various Physical, Chemical and Biological Parameters such as pH, Conductivity, Turbidity, BOD, COD, Chlorides and Hardness have been analyzed by standard methods of APHA 1998[1].

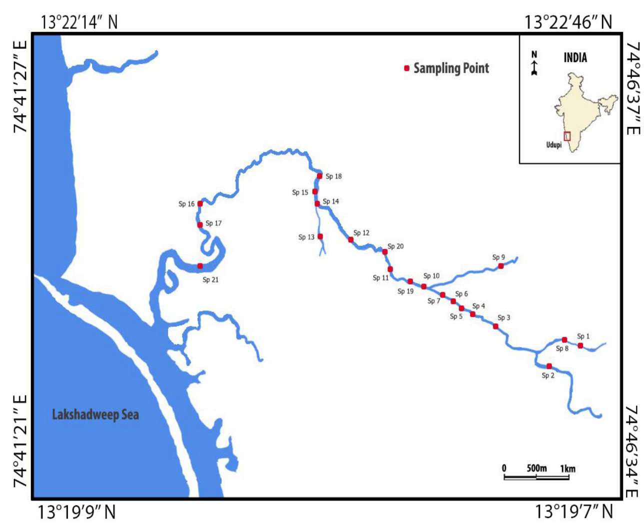

Figure 2. Shows Locations of Sample Point.

3. Result and Discussion

pH is the measure of Hydrogen ion concentration in water and indicates weather the water is Acidic or Alkaline. The result shown in Figure 3 indicates that the pH varies from 5.7-7.4. The pH value come under the permissible limits 5.5 – 9 as per IS 2490:1981[2].

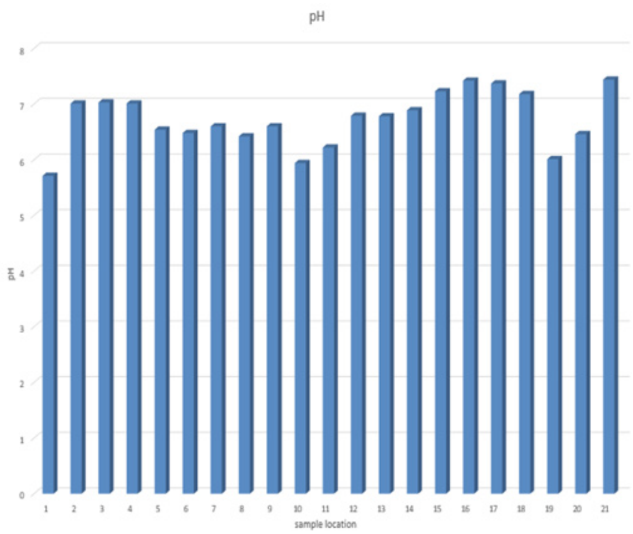

Figure 3. Shows the Variation of pH at Different Sample Location.

Conductivity is a measure of electric conductance per unit distance in an Electrolytic or Aqueous Solution. Electrical Conductivity determines the salinity of water.The basic unit of conductivity is Mho or Siemens. The results shows that the conductivity is higher at certain places.TDS is a measure of total amount of mobile charged ions, including Minerals, Salts or Metal dissolved in a given volume of water which is expressed in mg/L. Table 1 shows the values of conductivity at different sample points.

BOD or Biochemical Oxygen Demand is the amount of dissolved oxygen needed for the Aerobic Microorganisms to break down organic matter present in water at certain temperature over a specific time period. The presence of BOD in water denotes the presence of microbial activities in water which in turn represents the organic pollutants in water. Figure 4 shows that the BOD at certain places is increasing more than the permissible limit which is 100mg/L. The following chart shows the variation of BOD at different location of the system.

The Chemical Oxygen Demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water or wastewater,making COD a useful measure of water quality Figure 5. Shows that the values are within the permissible limit except at certain point.As per IS 2490:1981the permissible limit of COD of wastewater is 250mg/L.

Table 1. Readings of Conductivity and TDS at Different Locations of Drainage System

Sample Code	Sample Point	Conductivity	TDS (mg/L)
SP1	Indrahali Temple	148 μS/cm	77.82
SP2	Paniyadee(100m) Near Bridge	122.5 μS/cm	113.8
SP3	Shivalli Near Railway Station	76.65 μS/cm	70.72
SP4	Kasturba Nagar	90.52 μS/cm	85.11
SP5	Bailee Keree	103.6 μS/cm	94.58
SP6	Krishna Temple	191.8 μS/cm	100.1
SP7	Kalsanga	246.5 μS/cm	127.7
SP8	Railway Station	125.2 μS/cm	65.46
SP9	Paniyadi	172.4 μS/cm	89.07
SP10	Matatheebettu	371.7 μS/cm	337.8
SP11	Moodanidan Berru	351.9 μS/cm	337.8
SP12	Nitoor	998.2 μS/cm	531
SP13	Saibaba Mandir (100m)	736.1 μS/cm	661.4
SP14	Sai Baba Temple	1.323 mS/cm	650.5
SP15	Kodunkooru	710.2 μS/cm	633.2
SP16	Moodubettu	43.15 μS/cm	22.24
SP17	Kalmadi	38.7 μS/cm	17.97
SP18	Kodunkooru (100m)	740.5 μS/cm	706.6
SP19	Matathe Bettu (100m)	624.5 μS/cm	584.6
SP20	Moodunidan Berru(100m)	639 μS/cm	647.1
SP21	Malpe	55.85 mS/cm	58.44

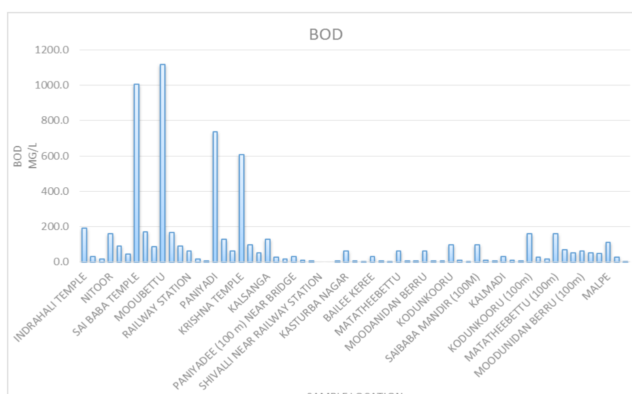

Figure 4. Shows the Variation of BOD Different Sample Location.

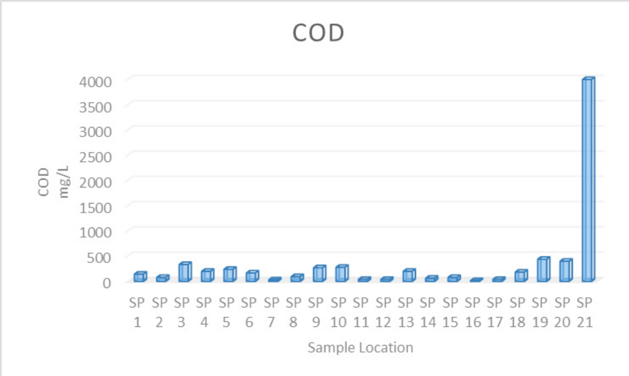

Figure 5. Show the Variation of COD at Different Sample location.

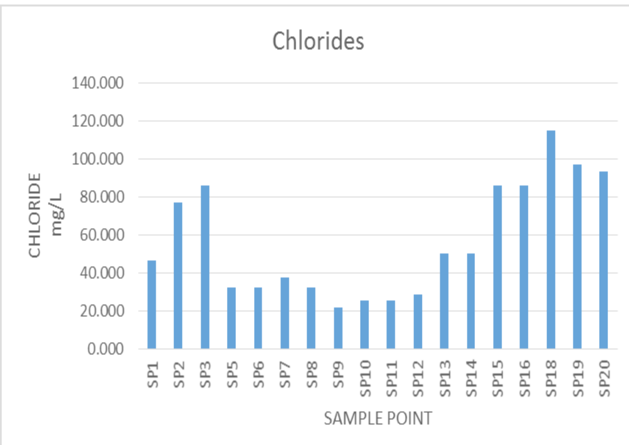

Figure 6. Shows that Chlorides are at Permissible Limits Except at Certain Places the Chlorides are more than the Permissible Limits which might the reason of Seawater Intrusion and Fertilisers.

4. Conclusion

The general picture is summarized in the Table 1. and other figures. This values are related with the permissible limits of IS 2490:1981 and the usability of water is analyzed.The result shows that special concern should be given to chemical content such as EC,Chlorides rather than biological content such BOD and COD. As seen

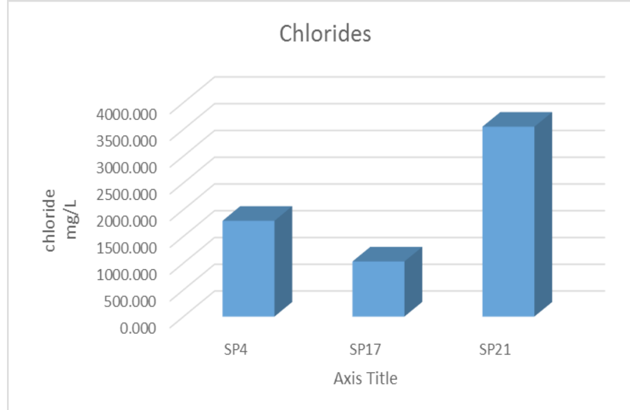

Figure 7. Shows the Variation of Chlorides at Different Sample Location.

from above the drainage is heavily polluted and its effecting surrounding area and this can be prevented by implementing Control Drainage System[3]. There is a need of effective strategies[4] for drainage water before mixing with Malpe beach.

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