IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Dissolved Oxygen & Co_2 Analysis Of Water Collected From Few Selected Freshwater Bodies From Udupi

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Abstract: Water plays an essential role in human life. Due to increased human population, industrialization, use of fertilizers in agriculture and made activity, freshwater bodies are being polluted. It is therefore necessary that the quality of drinking water should be checked at regular time interval. Human population suffers from a variety of water borne diseases. It is difficult to understand the biological phenomena fully because the chemistry of water reveals much about the metabolism of the ecosystem and explain the hydro biological relationship.

Key word: - Dissolved Oxygen, CO_2, Freshwater bodies.

I. INTRODUCTION

Water plays an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water [1]. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement [2]. Human and ecological use of ground water depends upon ambient water quality. Human alternation of the landscape has an extensive influence on watershed hydrology [3]. Fresh water plugs a vital role in human life. The consequences of urbanization and industrialisation leads to spoil the water especially in those areas where other sources of water like dam and river or a canal is not considerable [2]. The quality of water is of vital concern for the mankind since it is directly linked with human welfare [4].

Dissolved Oxygen is the amount of gaseous oxygen (O_2) dissolved in water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect dissolved oxygen levels. Oxygen dissolves easier in cooler water than warmer water. Adequate dissolved oxygen is important for good water quality and necessary to all forms of life [5].

Carbon dioxide is a naturally occurring gas can be found present in water in the form of a dissolved gas. Aquatic plant life depends upon carbon dioxide and bicarbonates in water for growth. Microscopic plant life suspended in water, phytoplankton, as well as large rooted plants, utilize carbon dioxide in the photosynthesis of plant materials; starches, sugars, oils, proteins. The carbon in all these materials comes from the carbon dioxide in water [6].

IMPORTANCE OF ESTIMATION

The water samples were collected from 15 different places in the morning hours between 6 to 8am, in polythene bottles. The water samples were immediately brought in to laboratory for the estimation of various chemical parameters like free CO_2 and dissolved Oxygen by winkler's iodide method.

Free CO_2 can be determined by titrating the samples using a strong alkali such as NaOH at pH 8.5, at this pH free CO_2 will be converted into bicarbonate ions. Phenopthalein is used as indicator. 100 ml of sample was taken in a conical flask and a few drops of phenopthalein indicator was added to it. If the colour of the sample changes immediately then that indicates the absence of free CO_2 in the water sample. If the sample remains colourless even after the addition if indicator, it was titrated against 0.05 NaOH.
Addition of 0.05 NaOH was stopped immediately after the colour turns to pale pink.

Dissolved oxygen can be determined by titrating the sample using starch indicator. Water sample was filled in glass stoppered bottle and any kind of bubbling or trapping of air bubbles in the bottle after placing the stopper was avoided. 2ml of each $MnSO_4$ and alkaline KI solution was poured into the sample from the walls by using separate pipettes. A white precipitate was formed. Stopper was placed into the bottle and contents were shaken well inverting the bottle repeatedly. The bottle was kept without disturbing for some time for precipitation to settle down. 2ml of conc. H_2SO_4 was added and the bottle was shaken well to dissolve the precipitate. If the water sample turns brown at this stage that indicates the presence of dissolved oxygen. 90ml of sub sample was taken and 1ml of starch indicator was added. This contents were titrated against Na_2SO_3 taken in burette till the initial dark blue colour was changed to colourless.

For both free CO_2 and dissolved O_2 for each sample we took 3 burette readings and calculated the Mean Burette Reading.

By using the following formula we calculated free CO_2 in mg/L,

$$\text{Free } CO_2 \text{ in mg/L of water sample} = \frac{\text{Mean Burette Reading x N of NaOH x 1000 x 44}}{\text{Volume of sample}}$$

By using the following formula we calculated dissolved oxygen per litre of water sample,

$$\text{Amount of dissolved oxygen/L of Water sample} = \frac{\text{Mean Burette Reading x N of } Na_2SO_3 \text{ x 1000}}{V_2} \times \frac{[V_2 - V]}{[V_1]} \times 8$$

V = Volume of $MnSO_4$ and KI added – 4ml
V_1 = Volume of sample in the bottle after placing stopper
V_2 = Volume of part of the contents titrated – 90ml

Covariance and correlation analysis of different samples were done [9].

DO & CO_2 PARAMETERS OF FRESHWATER SAMPLES

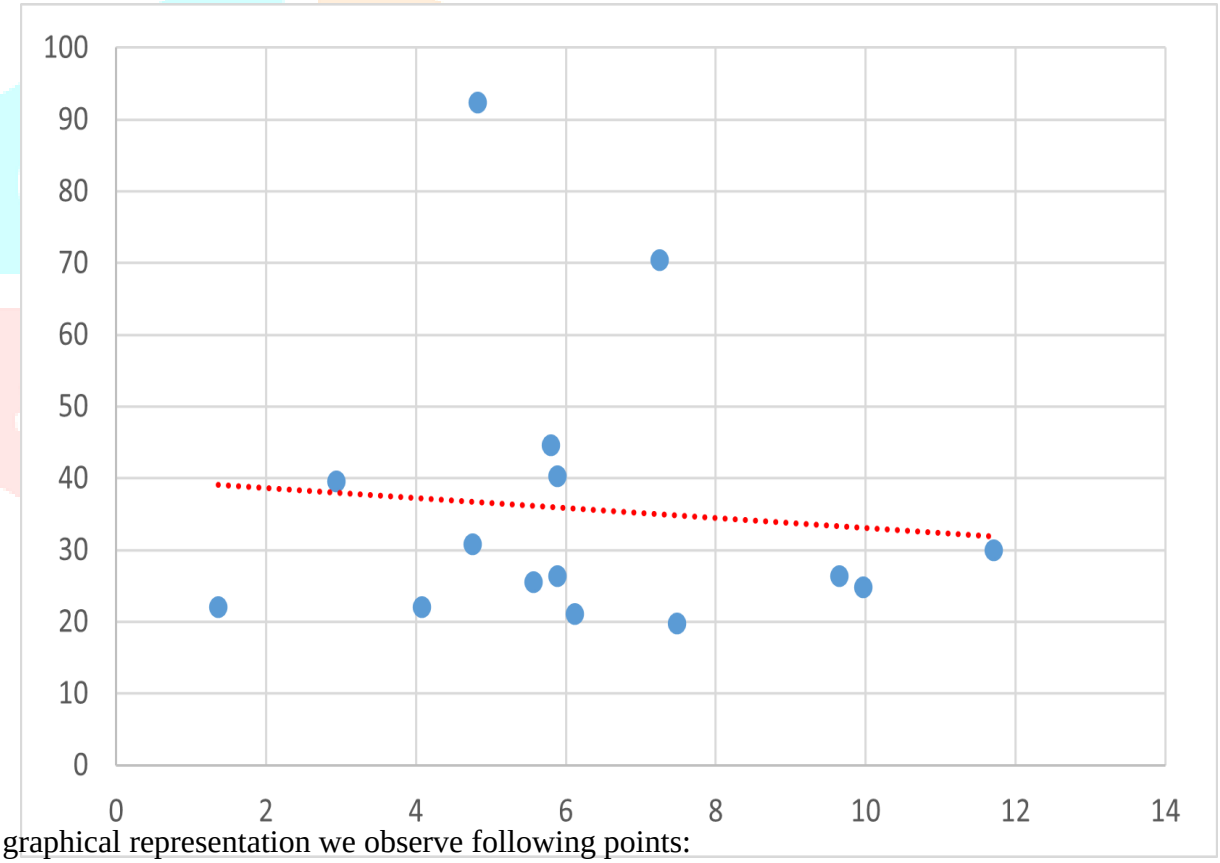
Sample no.	Type of sample	Location	Dissolved Oxygen(mg/L)	Free carbon Dioxide(mg/L)
1	Well water	Pethri	11.71	29.92
2	Well water	Padubidri	4.08	22
3	River water	Padubidri	1.36	22
4	Tap water	Ajjarakadu	9.97	24.86
5	Well water	Kukkikatte	4.82	92.4
6	Well water	Kokkarne	7.25	70.4
7	Tap water	Brahmavara	5.57	25.52
8	Well water	Brahmavara	5.89	40.26

9	Well water	Sasthana	2.94	39.6
10	Well water	Chitpadi	5.80	44.66
11	Well water	Adhmar	6.12	21.12
12	Well water	Puttige	4.76	30.8
13	Well water	Kaup	5.89	26.4
14	Well water	Kukkehalli	9.65	26.4
15	River water	Puttige	7.48	19.8

Dissolved oxygen: The values of DO fluctuates from 1.36 mg/L to 11.71 mg/L. The maximum values was recorded in the sample 1, collected from a well of Pethri. The minimum values was recorded in the sample 3, collected from a river of Padubidri.

Free carbon dioxide: The values of free CO_2 ranges from 19.8 mg/L to 92.4 mg/L. The maximum value was recorded in the sample 15, collected from a well of Kukkikatte. The minimum value was recorded in the sample 15, collected from a river of Puttige.

Correlation Graph



By this graphical representation we observe following points:

As the concentration of dissolved oxygen increases value of free CO_2 in the water decreases.

As the concentration of dissolved oxygen decreases value of free CO_2 in the water increases.

Co-relation value “r” is **- 0.1318**.

Value below zero expresses negative co-relation between DO &CO_2. Hence null hypothesis is rejected.

RESULTS

Highest free CO_2 in the water sample is **102.66**
Lowest free CO_2 in the water sample is **22**
Highest dissolved oxygen in the water sample is **11.62**
Lowest dissolved oxygen in the water sample is **1.35**
Co-relation value "r" is **- 0.1318** Values below zero expresses negative co-relation. Hence null hypothesis is rejected.

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Conclusion

The research was conducted on "Dissolved Oxygen & CO_2 analysis of water collected from few selected freshwater bodies from Udupi".
The result obtained during this project has negative correlation. As the concentration of dissolved oxygen increases value of free CO_2 in the water decreases.

As the concentration of dissolved oxygen decreases value of free CO_2 in the water increases

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