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Impact of Industrial Pollution on Godavari River Water with Respect to Fluctuation in CO_2 and pH.

KEYWORDS: Godavari River, Industrial effluents, pH, CO_2.

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ABSTRACT *Systematic study has been carried out to assess the impact of industrial pollution on Godavari river water with respect to fluctuation in CO_2 and pH. To know the national responsibility of any country, Industrial development is one of the important criteria is to judge the progress. Aurangabad city is blessed with the river Godavari. Recently witnessed tremendous growth in the various industries like pharmaceutical Industries, Agro based Industries, beverage Industries etc. The industrial effluents that are released in to the river have resulted in to detoriation of the water quality and river faces a serious threat not only to its own health but also to community development of this water source. In the present investigation an attempt has been made to access the extent of pollution and its impact on potable water quality on the basic two parameters like pH and CO_2 in the river water. Samples were collected during the year 2011 to 2012 from different sampling stations for the analysis of water. From the data collected it can be concluded that inverse relationship which is known to exist between pH and CO_2 is not existent in the present investigation.*

INTRODUCTION:-
Water resources has been the most exploited natural system since man strode the earth water is an essential requirement for all biological systems. River systems are the major sources of the drinking water and the means of sustaining human animal and plant life despite its abundance its vast resource has come to exist as a scarce commodity. Increased Urbanization and Industrialization caused stress on the self-purification mechanism of rivers (Patil & Ghorade 2013). Advances in science and technology have produced many new compounds that have been released into the watery environment and produced new water problems. These problems are at the same time raising consciousness about the importance of water quality .Our need for quality water growing rapidly. Just as water conditioning can provide the high quality water needed for space technology, so water conditioning can be a major factor in removing contaminants-synthetic organic chemicals that do not degrade very rapidly produced by that technology.

Our life span is longer today than every before, and we are becoming aware that our entire environment particularly our food and water systems should be scrutinized. Perhaps certain substances should be added and others removed from the little over a quart of water needed by every person each day. Water is a chemical compound and to make decision about the water, a person should know enough about basic chemistry to understand waters unique behaviour. The water quality of the rivers and reservoir varies from time to time and place to place, due to interaction of local factors, in the absence of any in depth knowledge about the water quality and ill effects the inhabitants rare prone to disease and health problems (Patil and Ghorade, 2011).

The contamination of river water from the manmade and natural sources is causing a great threat to the ground water system. The increase in urbanization and industrialization are generating huge quality of waste and wastewater (Hassan et.al 2013). The disposal of these waste and wastewater without proper treatment on unlined surface is finding its way to groundwater through percolation. The increase in use of chemical fertilizers, insecticide and pesticide in agricultural field has also contaminated the revae water

MATERIAL &METHODS:-
Four sampling stations were selected after survey from upper Godavari and lower Godavari river basin approximately at the distance of 50 km, as per the guidelines of Maharashtra Pollution Control Board and Central Pollution Control Board for the analysis purpose. Sampling Station S1- Kopergaon Bridge, S2- Kaigaon Toka, S3- Jaikwadi Dam, and S4-Kholin Naka.

The relevant methodologies given by APHA for the determination of these above different physical and chemical parameter were adopted. Brief descriptions of analytical methods used for physico –chemical parameter are discussed below.

pH:-This is a measure of the intensity of the alkaline or acid conditions of the solution. It is the way of expressing the "hydrogen ion concentration ". It is important not only in the fields of water supplies, disinfections, chemical coagulation, water softening and corrosion control, but also in water treatment employing biological processes and dewatering of sludge's . They all require pH control within narrow limits, because of fundamental relationship that exists between acidity-alkalinity, a very high or very low pH is injurious to the ecosystem. pH measurements were done by using standardized pH meter [ELICO make].

Free carbon dioxide (CO_2):- Free CO_2 reacts with sodium hydroxide to form sodium bicarbonate. The reaction is indicated by the appearance of pink colour by phenolphthalein indicator at the equivalence pH of 8.3.

RESULT AND DISCUSSION-
Table No.1 Average Seasonal values of CO_2 and pH from Godavari River water sample (2011-2012)

Season	Parameters	S1	S2	S3	S4
Monsoon	Co_2 mg/l	18.60 ±4.2	12.19 ±2.6	18.34 ±3.2	18.22 ±3.6
	pH	7.27 ±0.9	7.18 ±0.5	7.82 ±0.6	7.96 ±0.8
Winter	Co_2 mg/l	16.18 ±2.6	13.34 ±2.1	16.88 ±3.8	17.20 ±2.2
	pH	7.73 ±0.4	7.79 ±0.9	7.62 ±0.6	7.69 ±0.8

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Summer	Co_2 mg/l	15.19 ±3.1	10.19 ±4.0	18.45 ±2.8	18.66 ±2.5
	pH	7.89 ±0.7	7.95 ±0.5	7.82 ±0.4	7.90 ±0.7

S= Station, ± = Standard Deviation

pH:-During the year 2011-12,the pH values were ranged from 7.18 (S2) to 7.96 (S4) in monsoon, from 7.62 (S3) 7.79 (S2) in winter and 7.82 (S3)to 7.95 (S2) in summer season. From the observed data it is concluded that there is a slight increase in the pH in the monsoon season which reflects the gradual increase of weakly alkaline to moderately alkaline characteristics of ground water. The slight increase of pH can be attributed to discontinued supply of Co_2 due to cessation of rain fed charge of the aquifer (Pondhe, et al., 1997; Deshmukh and Pawar, 2000; Jadhavar, 2013). Generally, the pH of water varies due to changes in temperature, biological activities, disposal of industrial wastes and photosynthetic activities. These factors may cause a drastic change in pH and in turn reduce the potability of water (Mani Megalai and Muthalakshmi, 2006). The pH values in the present study found to be within the permissible limit of WHO (6.5 to 8.5) in all the sampling stations. The low pH does not cause any harmful effect (Jameel, 2002). A change in pH changes the chemical composition of water due to precipitation and solution or change of valance. The reaction of minerals in rocks with water carbon dioxide and possibly organic matter, such as humic acid and fulvic acid changes the pH of water (Raj and Jayshekher, 2007).

Free (Co_2) carbon dioxide:- It exists in varying amounts naturally in water. Most well waters will contain less than 50 ppm of carbon dioxide in drinking water. A large amount of carbon dioxide in water creates an acidic water conditions. When carbon dioxide dissolves in water it creates the following reactions.

$H_2O + Co_2 \rightarrow H_2CO_3$ (carbonic acid)

$H_2CO_3 <====> H^+ + HCO_3$

The dissociation of carbonic acid yields hydrogen (H^+) and bicarbonate alkalinity (HCO_3). Due to the carbon dioxide in water, pH value will drop as the concentration of carbon dioxide increases, and conversely will increase as the bicarbonate alkalinity content of water. Carbon dioxide in water with a pH of 3.5 or below generally contains mineral acids such as sulphuric or hydrochloric acid. Carbon dioxide can exist in waters with pH values from 3.6 to 8.4, but will never be present in waters having a pH of 8.5 or above. The pH value is not a measurement of the amount of carbon dioxide in the water, but rather the relationship of carbon dioxide and bicarbonate alkalinity. In the year 2011-12 it also varies from 12.19 (S2) to 18.60 (S1) in monsoon, 13.34 (S2) to 17.20 (S4) in winter season and from 10.19 (S2) to 18.66 (S4) in summer season.

When water containing CO_2 is used for drinking purpose then it is absorbed very slowly through the gastrointestinal tract, at a much lower rate than it is produced in cells and expired out of the lungs. The gas expansion from release of dissolved CO_2 in carbonation can lead to the distension of the stomach (Jadhavar, 2013). Aside from the less serious case of triggering hiccups, irritable bowel syndrome (IBS) can also be aggravated. Furthermore, the stomach distension may reduce the effectiveness of stomach acid to digest food that requires sufficient acidity. Sufferers of IBS are advised to eliminate carbonated drinks from their diet (as well as many other items) to allow the GI lining to heal (Kasthuri, et al., 2005).

Carbon dioxide (CO_2) released into the oceans as a result of water pollution by nutrients which is a major source of this greenhouse gas that gets little public attention. It is enhancing the unwanted changes in ocean acidity due to atmospheric increases in CO_2. Atmospheric levels of CO_2, the main greenhouse gas, have increased by about 40 percent since the industrial revolution due to the burning of fossil fuels and land-use changes. The oceans absorb about one-third of that CO_2, which results in acidification from the formation of carbonic acid. However, pollution of ocean water with nutrient runoff from fertilizer, human and animal waste and other sources also is adding CO_2 via the biological breakdown of organic matter formed during algal blooms which also depletes oxygen from the water.

The effluents and domestic wastes discharged by locality enter in the river, due to which maximum values of Co_2 were observed (Haniffa et al. 1993).In the rainy season river carries runoff soil and clay and the pollutants from catchments area along with industrial sewage are responsible for the moderate values of Co_2.During the study period, the river Godavari maintained alkaline pH of water. These observations are similar with those of Mohonta and Patra,(2000).

CONCLUSION:-

From the data collected it can be concluded that inverse relationship which is known to be exist between pH and CO_2 is not existent in the present investigation. The river water maintains the alkaline pH the relative concentration of bottom sediment was found to be more in the month of summer due to reduced level of water. The increased photosynthetic activities and intense sunlight causes the assimilation of bicarbonates by phytoplankotons, which lower the pH of water to some extent. The maximum values of pH in monsoon may be due to mixing of industrial effluents in the river water. The reduced rate of photosynthetic activities reduces the assimilation of CO_2 and bicarbonates which is ultimately responsible for increase in pH.

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