
Surface and Underground Water Analysis for Determining the Pollution level in Dist. Bulandshahr Region

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ABSTRACT

As the population increases, the rapid industrialization and urbanization results pollution in water and untreated water also contains pathogenic or faecal matter. In view of the above, there is need for an accurate and reliable estimate of water quality for effective management of water and taking adequate measures to keep water either free from pollution or to keep the concentration of various pollutants of water within permissible limits. During the present study of water pollution was calculated with the measurement of level of oxygen present in water and some other parameters like alkalinity of water. In this investigation water pollution was measured by organic (e.g., DO, BOD, COD) and physical (e.g., pH, Temperature, Colour, Turbidity, Odour) means. The water samples were collected from ten different places in Dist. Bulandshahr region during November to December and May to June months. For this study among the ten samples two of them were collected from Ganga Nahar and Kali Nadi because these two sources of water used for different purposes like agriculture, fishing and other purposes abundantly. During study some of the samples were also drawn from underground water from different places because amount of oxygen present in water indicates purity of water means whether it may use for the human consumption (drinking purpose) or not.

Keywords: *Organic testing, Physical testing, Water, Pollution.*

INTRODUCTION

Rapid industrialization and urbanization have polluted the water resources of Dist. Bulandshahr. Chemical, physical, biological and radiological characteristics of water refers to the water quality although the water quality analysis required to check whether the water quality is incompliance with the standards, and hence, suitable or not for the designated use. During organic water quality analysis determine the concentration of carbon-based compound. Physical methods includes analytical tests designed to measure a varied group of constituents directly impact wastewater treatability (e.g., temperature, colour, pH, turbidity, and odour) (Grasshoff *et al* 1983). Industrial effluents go into the water system and change the physiochemical quality of water. Thus water become unfit for human consumption and creates difficulty for survival of aquatic life. Waste compounds which contains nutrients and bacteria, when they will introduce in water system then biochemical reactions initiates. These biochemical reactions are measured by DO, BOD and COD in laboratory (Tehovanoglous *et al*, 2003). All these organic tests are measure to relative oxygen depletion and effect of waste contaminants. All these have been widely adopted as measure of pollution effect. The DO and BOD tests measure the oxygen demand by biodegradable pollutants and COD test measures the oxygen demand by oxidisable pollutants. Chemically, waste water is composed of organic and inorganic components and as well as various gases (Tehovanoglous *et al*, 2003 and Maiti, 2004).

STUDY AREA

Bulandshahr Dist. is a small town situated near the Delhi NCR in West U.P. Due to rapid industrialization pollution increasing day by day. For the analysis of water quality the samples were collected from ten different areas of Dist. Bulandshahr. We collected samples from Underground water, River water and Pond water from different places in different seasons i.e. in November (winter season) and in May (summer season) month.

MATERIALS AND METHODOLOGY

The DO, BOD and COD of water sample were measured by the titration method in laboratory. The Winkler method is a technique which used to measure dissolved oxygen in freshwater systems. Dissolved Oxygen is used as an indicator of the health of a water body, where higher dissolved oxygen concentrations are correlated with high productivity and little pollution (J.H. Carpenter 1965 and J.D.H. Strickland *et al* 1968). For measuring BOD, water samples were incubated at 27 °C for 3 days in dark under aerobic condition. Oxygen is also consumed during nitrification. Therefore, 1ml of 0.05% allylthiourea was added to water samples. Then the dissolved oxygen content of the sample was calculated before and after incubation at specific temperature and BOD was calculated from the difference between the DO of samples before incubation and the DO of sample after incubation at specific temperature (R.C. Dubey *et al* 2002). BOD estimation could not give the exact idea of pollutants present in water, therefore, COD was estimated. The COD is often measured using a strong oxidant (e.g. potassium dichromate, potassium iodide, potassium permanganate) under acidic conditions. An acidic condition is given for catalysing the reaction. Here we used potassium iodide or ammonium oxalate as a reducing agent. A known excess amount of the oxidant was added to the sample. Once oxidation was completed, the concentration of organics in the sample was calculated by measuring the amount of oxidant remaining in the solution, this was usually done by titration, using an indicator solution (starch indicator) (R.C. Dubey *et al* 2002).

OBSERVATION

Table 1: Water analysis of surface water of Bulandshahr (U.P.)

Sample	RW-1	PW-1	PW-2	PW-3	RW-2
Name of water body	River water	Pond water	Pond water	Pond water	Ganga Nahar
Location	Kali Nadi	Dariyapur	Dibai	Khurja	Khurja road
City	Bulandshahr	Bulandshahr	Bulandshahr	Bulandshahr	Bulandshahr
Colour	Blackish	Dark brown	Greenish	Blackish	Yellowish
Odour	Unpleasant	Unpleasant	Unpleasant	Unpleasant	Odourless
pH	5.0	5.5	5.2	5.3	6.5
DO (Nov-Dec) (mg/L)	4.2	4.4	4.0	4.8	4.9
BOD (Nov-Dec) (mg/L)	3.6	3.7	3.5	4.0	3.2
COD (Nov-Dec) (mg/L)	192	190	138	182	128
DO (May-Jun) (mg/L)	4.6	4.5	4.8	4.8	5.2
BOD (May-Jun) (mg/L)	4.0	3.8	4.2	4.0	4.5
COD (May-Jun) (mg/L)	198	194	142	190	135

Table 2: Water analysis of Ground water of Bulandshahr (U.P.)

Sample	GW-1	GW-2	GW-3	GW-4	GW-5
Name of water body	Ground water	Ground water	Ground water	Ground water	Ground water
Location	Krishna nagar	Panni nagar	Satha colony	Shanti Niketan Colony	Yamuna Puram
City	Bulandshahr	Bulandshahr	Bulandshahr	Bulandshahr	Bulandshahr
Colour	Clear	Clear	Clear	Clear	Clear
Odour	Odourless	Odourless	Odourless	Odourless	Odourless
pH	7.2	7.0	7.0	7.2	6.8
DO (Nov-Dec) (mg/L)	5.8	6.0	6.4	6.0	6.2
BOD (Nov-Dec) (mg/L)	1.8	2.6	2.9	2.2	2.5
COD (Nov-Dec) (mg/L)	22	18	24	25	22
DO (May-Jun) (mg/L)	5.5	5.8	6.2	6.0	5.9
BOD (May-Jun) (mg/L)	1.6	2.2	2.6	2.0	2.2
COD (May-Jun) (mg/L)	18	15	21	22	19

DISCUSSION

A dissolved oxygen level that is too high or too low can harm aquatic life and affect water quality. The source of dissolved oxygen in water are the autotrophic aquatic plants which as a result of photosynthesis evolve oxygen and air from O₂ is dissolved in water depending on salinity, temperature and water movement.

Dissolved oxygen is necessary to many forms of life including fish, invertebrates, bacteria and plants. These organisms use oxygen in respiration. Microbes such as bacteria and fungi also require dissolved oxygen. These organisms use DO to decompose organic material at the bottom of a body of water (ICMR 1996 and Marcel Dekker 2000).

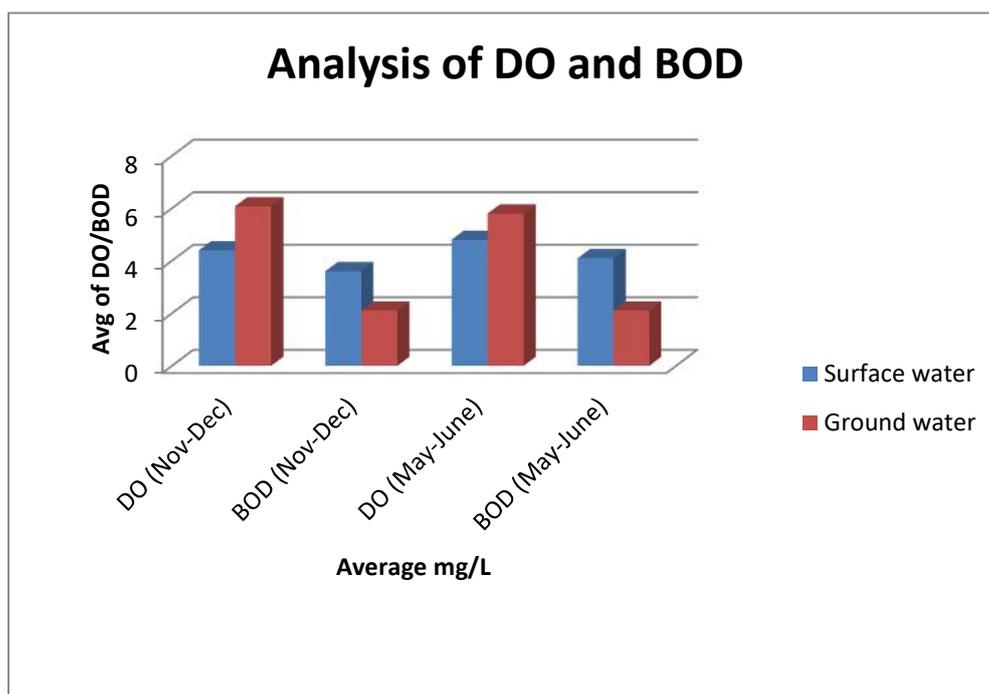
It is represented by the amount of organic matter present in water or effluents. The higher the BOD, the more oxygen will be demanded from the waste to break down the organics. High BOD create environmental and health problems. Moreover it interferes with the aquatic life. Organic pollution is harmful to fish as it tends to reduce the amount of dissolved oxygen. It is widely used as an indication of the quality of water. If there is a large quantity of organic waste in water supply, there will also be a lot of bacteria present working to decompose this waste. In this case, the demand for oxygen will be high (due to all the bacteria) so the BOD level will be high.

The chemical oxygen demand (COD) is a measure of water and wastewater quality. The COD test is often used to monitor water treatment plant efficiency. The higher the chemical oxygen demand, higher the amount of pollution in the test sample. Higher COD levels mean a greater amount of oxidizable organic material in the sample, which will reduce dissolved oxygen (DO) levels. A reduction in DO can lead to anaerobic conditions, which is deleterious to higher aquatic life forms. The COD test is often used as an alternate to BOD due to shorter length of testing time.

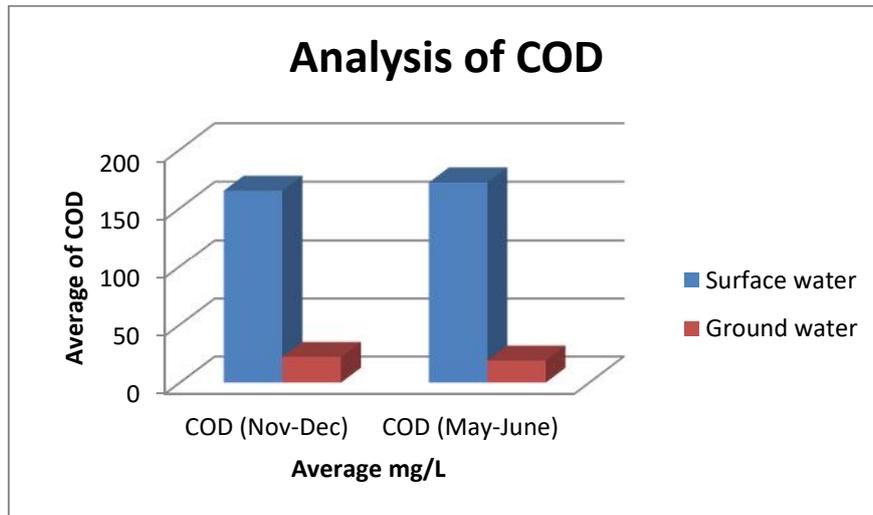
According to the, Central Pollution Control Board (CPCB) the permissible limit of dissolved oxygen, biological demand oxygen and chemical oxygen demand is 6.0 mg/L, 3.0mg/L and 10 to 30mg/L respectively. This permissible limit of the water quality tests is required by the drinking water (WHO 1999 and CPCB 1990-2001).

CONCLUSION

Surface and underground water quality analysis (DO, BOD & COD) indicates us that the surface water or water collected from either rivers or pond or lakes is highly polluted and it is required to water management and to make sure that industrial effluents and sewage water should not introduce into these resources because if surface water polluted they cause adverse effect on aquatic organism even though this water may not use for agriculture purpose also. It was also concluded that the average of oxygen dissolved in surface water (4.4- 4.8 mg/L (Nov & May)) and underground water (6.08-5.8 mg/L (Nov & May)) somehow found to be similar. But in most of the cases the amount of oxygen dissolved in surface water is very lower than the permissible limit indicate that this water is highly polluted. The BOD of surface water was found between 3.6-4.1 mg/L (Nov & May) and of ground water between 2.1-2.1 mg/L (Nov & May). The determination of DO and BOD did not give the actual picture of water pollution level thus analysis of COD is required.



COD of both types of water samples gave very surprising results and make the picture very clear regarding pollution level in water, that were the COD of surface water was found to be very high (165-172 mg/L (Nov & May)) and the COD of ground water was found between 22.2-19 mg/L (Nov & May). The higher level of COD in surface water indicated that this water was highly contaminated and required water management. It was also concluded that amount of oxygen dissolved and COD did not affected seasonally but somehow it was also found that in summer season (May-June) the level of COD slightly less than that of winter season (Nov-Dec).



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