



A SCIENTIFIC CORRELATION AMONG THE QUALITIES OF SURFACE AND UNDERGROUND WATER SOURCES IN BALLIA

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ABSTRACT

The present paper deals with the surface, river and underground water quality with respect to physicochemical characteristics i. e. pH, temperature, DO, BOD, COD, TDS etc. The work has been carried out in the Ballia district covering the sites viz. River Ganga at Mahaveer ghat and Lakda Nallah at Singhpur for surface water analysis and samples of Borewells at Singhpur, handpumps and supply water at Chandrashekar Nagar. The samples were studied on Oct 2018 and a few of the pollutant parameters were investigated on the spot. The physicochemical characteristics show that the temperature, TDS, alkalinity and hardness depend upon the sewage and effluents which mix into the water bodies. The pH, alkalinity and COD increase due to addition of domestic and industrial wastes discharged into water bodies, whereas the hardness, alkalinity and TDS increase in ground water resources. The DO is under permissible limit becomes lesser where industrial and domestic wastes are added and result in the increase in BOD level.

INTRODUCTION

The challenge of pure water is one of the big environmental challenges that India may face in coming decades is that of balancing its increasing demand with diminishing availability of water. The Indian subcontinent is rich in its water resources. Water is among the most essential requisites that nature provides to sustain life on earth. The total quantity of fresh water on earth can satisfy all the needs of human population if it would have been evenly distributed and accessible.

Rivers play a key role in balancing the hydrological cycle and in providing water for drinking, municipal industrial and irrigation consumption hydroelectric generation water way transport and acts as sinks of domestic municipal and industrial wastes. The inland freshwater ecosystem are being increasingly subjected to greater stress from various human activities 58. Water of river ganga flowing through ballia district of uttar pradesh is extensively used for domestic municipal agriculture etc purposes due to some other anthropogenic activities there is eutrophication of water in surface water bodies i.e river ganga and some other nallahs According to vollenwieder 13 the domestic sewage is a major source of eutrophication .

The enrichment with nutrients occurs due to the disposal of domestic and form sewage industrial effluences and from the runoff from surrounding areas the domestic sewage and industrial effluent etc do not only effect the characteristics (physico-chemical & biological) of surface water but it also affects the properties of ground water the domestic sewage is disposed off either into underground water through soakpits. There have been numerous investigations on the impact of domestic sewage changing the physico-chemical and biological characteristics of fresh waters in europe and america . In india also few workers like sastry etal 10 . and arora etal 3 . have worked on the same problems. water bodies have some self purification capacity but in most instances the level and quality of domestic wastes and effluents discharged is far beyond the purifying capacity.

The fundamental physico-chemical properties of water depends largely on the components present in dissolved form in the water. the presence of organic matter in water bodies together with inorganic particulate debris, produces stable chelates of trace metals and prevents thier precipitaion as insoluble inorganic salts . Most organisms can accumulate metals in excess of thier immediate needs. animals and plants need heavy metals as a co-factor in several enzyme systems including those involved in respiration and nitrogen metabolism.

The problem of surface water of ballia is enriched with nutrients causing eutrophication while the ground water is inriched with minerals The river water quality is degrading leading to a pre dominantly unfavourable enviornment for its inhabitants . Government of india launched a series of action plans to control the ganga water pollution and improve water quality 6 .

MATERIALS AND METHODS

For the analysis of correlation between surface and underground water Five Different sites were collected.

Site-1 ; (For surface water)

sampling site is mahavir ghat of river ganga situated at ballia.
Site-2 ; (surface water)

lakda nallahat singhapur is the site selected for physico-chemical analysis.

Site -3; (Underground water)

Hand pumps of chandra shekhar nagar situated at ballia

Site-4: (Underground water)

samples collected from the tap water (supply water) supplied at chandra shekhar nagar

ballia

Site-5: (underground water)

water samples collected from the bore wells of singhapur ballia samples were taken from different sites at different spots and mix them gently for further analysis.

The Temperature was recorded by laboratory thermometer. The pH was observed by portable digital of pH meter. estimation of d.o was carried out by winklers modified azide method and for biochemical oxygen demands the water samples were incubated at 20 degree for 5 days in dark. total dissolved solids were measured on even dry weight basis, alkalinity and total hardness were analysed as per methods describe in the standard methods. COD and other parameters were also analysed with the help of standard methods for the analysis of water and waste water and by using laboratory manual.

Table 1

Physico-chemical Properties Dated Oct 2018

Characteristics	lakda nallah	River water	Hand Pump	Tape water	Bore-well
Temp OC	15.5	15.8	18.4	18.7	20.1
pH	8.42	8.05	6.86	7.65	7.1
COD(mg/L)	120	60	38	238	29
BOD(mg/L)	33.8	35.7	0.0	4.0	0.0
DO (mg/L)	4.8	4.5	3.1	3.6	3.5
T. Hardness (mg/L)	132	130	312	186	305
Ca Hardness (mg/L)	94	90	220	130	212
mG Hardness (mg/L)	38	40	92	56	93
Alkalinity(mg/L)	154	262	412	341	388
TDS (mg/L)	270	291	595	495	492
Turbidity(mg/L)	4.40	1.30	1.32	11.8	1.1
Coliform	14	13	02	04	00
E. Coliform	04	06	00	00	00

Table 2

Physico-chemical Properties Dated Oct 2019

Characteristics	lakda nallah	River water	Hand Pump	Tape water	Bore-well
Temp OC	18/.2	17.9	20.1	19.8	21.5
pH	8.48	8.15	7.05	7.50	7.23
COD(mg/L)	136	68	32	240	28
BOD(mg/L)	32.	34	00	06	00
DO (mg/L)	4.2	4.9	3.1	2.9	2.4
T. Hardness(mg/L)	142	152	310	180	303
Ca Hardness(mg/L)	99.4	106.4	217.0	126	212
mG Hardness(mg/L)	42	45	93	54	91
Alkalinity(mg/L)	151	270	400	352	399
TDS(mg/L)	280	294	588	490	506
Turbidity(mg/L)	4.0	1.4	1.4	10	1.8
Coliform	18	15	04	06	00
E. Coliform	05	05	00	00	00

RESULTS AND DISCUSSION

some important physico- chemical properties of water are depicted in Table 1 and 2 . Temperature increases according to the depth of water resources (Table-1) In this table the temperature of lakda nallah and river ganga are 17.5 degree celcius. each where as the temperature of borewell water sample is maximum i.e 20.1 degree celcius.

The pH on alkaine side in the samples of river- ganga and lakda nallah due to addition of industrial and agricultural wastes. people take holy bath in river ganga , is also one of the important reason of increasing the pH which is controlled in under ground water resources .

(table 1 and 2) dissolved oxygen gives more information about the nature of water of different samples for instance the DO increasing in surface water resources i.e 4.5 mg/l to 5.5 mg/l where as the do is slightly decreasing in under grand sources i.e 2.4 mg/l

The biochemical oxygen demand was much higher and beyond of permissible limit in surface water i.e 32.8 while in under ground water bod is controlled according to the quantitative statement of table 1 and 2 bod was much higher in polluted site due to heavy load of organic matter. it is very good index of pollution load

cod test is widely used for measuring polluted strength of waste water the result shovs much variation in cod and the value is higher in supply water of ballia hardness and alkanity increases in underground water samples due to presence of more irons in soil where lesser amount is it surface water in january month due to low temperature.

the maximum value of nitrate and phosphate was recorded in lakda nallah 385 respectively while the lesser amount of nitrate is in supply water. and phosphate is in borewell water i.e The concentration of nitrate and phosphate at different

sites vary but higher in surface water and lesser in underground water. The turbidity was maximum in supply water of ballia.

some bacteriological investigations also taken place e.g coliform and E. coli eschrichia coli test. the presence of microbes in surface water is beyond the permissible limit of who and icmr

among the physical factors temperature plays an important role in growth and distribution of aquatic macrophytes This is one of the important factors influencing altitudinal latitudinal and in depth variations of the distribution of aquatic species as also suggested by aiken and gillet . The temperature of the surface water was significantly correlated with the ambient temperature .pH play significant role in the metabolic activities of aquatic macrophytes . increasing of pH is due to anthropogenic activities etc. agricultural operations industrial effluents etc. due to high pH and do the production has been shown high (srivastava) nitrate and phosphate values favour the lush green patches of tolerant macrophytes and cause of eutrophication. presence of caliform bacteria and e. coli indicates the pollution level of water body. due to addition of wastes of sewers as well as domestic quantity of micro organism increases . BOD and COD also increase due to heavy organic load.

CONCLUSION

The corelation between surface and underground water indicates that the surface water is polluted mainly by anthropogenic activities like agricultural operation, fertilizers , pesticides and industrial effluents. According to this study we should adopt some remedial measures like to educate the people towards the use of water , not a single drop of waste water should reach into the river without treatment and and a complete common waste water treatment plant should be established in ballia. because of this to maintain the physical status , tomorrow should not be bastard away .

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