GROUND WATER QUALITY: ITS ENVIRONMENTAL IMPACT OF ALIGARH CITY (U.P.)

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Synopsis- Several salts accumulate in the soil zone either by weathering of soil mineral or as the residue left behind by evapo – transpiration. Sediment under saline environments may also contain salts which remain unlashed. Surface water/ rain water percolating through these mineral dissolved out various soluble ions. Soluble salts such as NaCl, MgCl2, MgSO4 & $NaHCO_3$ easily get dissolved in percolating water. Calcium sulphate is moderately soluble in pure water but its solubility increases by dissolved CO2. The solubility of various other minerals is also affected by pH.redox potential of water . The legend and the chelating agents present in the system.

The area under investigation i.e. Aligarh city lies in the Ganga – Yamuna doab and from a part of Central Ganga Basin. It falls under subtropical climate Zone and is charactized by hot summer and chilly winter. The monsoon rain fall breaks in second week of June and ends in September.

The present study deals with the Environmental impact on Ground water Quality Of Aligarh City (U.P) the chemical analysis data of 18 water sample from shallow and deep aquifer systems are systematically computed both for pre- monsoon and post monsoon seasons. The increasing trend observed for electrical conductance shows a considerable increase in salinity for shallow ground water sample from pre- monsoon to post monsoon season. Salinity tends to increase in deep aquifer system, as well, but to lesser extent.

For the entire study area during pre – monsoon season 61 % water sample have Ca-Mg – HCO_3 type and 11% wells exhibit Na-Cl type water , whereas , in post –monsoon season 50% water sample show Ca-Mg-HCO_3 type water and 22% Na-Cl type water 28%water sample exhibit Na –HCO_3 type water both in pre and post – Monsoon season. 57% , 43% & 64% post – monsoon water sample show increase in SO_4 , Cl and (Ca & Mg) values respectively whereas , 100% 75% & 59% deep ground water sample show increase in Mg ,HCO_3 and (Cl & Na) values respectively. The percolating rains during its passage through the soil dissolve secondary evaporate and various other ions from the mineral deposits in the

area and result in increase values for these ions. Marked change in water quality from pre monsoon to post monsoon season is observed in 50% of the water sample. One third of these water sample exhibit change from Ca –Mg - HCO_3 & Na-HCO3 type to mixed & NaCl type showing end product water , One third samples show change in water type from Ca-Mg – HCO_3 type as a result of base exchange phenomenon and the remaining water sample change from mixed & Na (1type to Ca – Mg HCO_3 type exhibiting recharging water.

INTRODUCTION

Rain water maintains equilibrium with atmospheric carbon – di- oxide (CO2) and can dissolve only a small amount of minerals. In the soil zone the pressure of CO_2 is elevated due to decay of organic matter and root respiration. Plant assimilates atmospheric CO_2 in to organic compound and considerable part of it is transformed to the plant root to maintain its growth and root function. The root zone is a steady source of CO2 which by diffusion maintains a constant pressure not only within in the intermediate zone also. The high partial pressure of CO_2 in the unfractured zone effects weathering of various mineral that in turn effects the concentration of various constituents in water. CO_2 with forms H_2CO_3 which dissociate to release hydrogen ions. The hydrogen an ion penetrate in to the crystal lattice of most of the minerals and displays the cation till equilibrium is reached and consequently the crystalline lattice get weekend collapse. The released ions are leached by percolating water and enter into the ground water system. This paper deal with the study of environmental impact i.e. rain water percolating through the soil zone, on ground water quality of Aligarh city both during pre and post monsoon season.

STUDY AREA

Aligarh city falls between N latitude 27^0 50’ 30 ” & 27^0 56’15 and E longitude 78^0 02’00’’&78^0 07’50’’ (approx) covering an area of about 75 sq. Km. it is one of the most prominent cities of the Ganga -Yamuna doab and froms at Central Ganga Basin . The climate is subtropical and is characterised by hot summer and chilly winter. The average rainfall in the area is 759 mm.

APPROACH & METHOD

The chemical analysis data of 18 water sample from shallow and deep aquifer system of Aligarh city (Teach. Report, 2000)[1] both for pre monsoon and post – monsoon season are systematically computed to assess the ground water quality change due to rainfall.

Preparation of modified piper diagram [2] using chemical analysis data of water sample (pre & post – monsoon season), for geo chemical classification of ground water.

Graphical representation of variation in concentration of various ions due to the impact of environment.

RESULTS AND DISCUSSION

Systematic study of the analysis results obtain for the well waters of Aligarh city (U.P) show the existence of three type of water in the area viz. $NaHCO_3$ type ,$CaMgHCO_3$,type and NaCl type , Geo chemical classification of ground during pre monsoon season exhibit 61% well water season , 50% well impart $CaMgHO_3$ type water and 22% well show NaCl type water . However 28% well water exhibit $NaHCO_3$ type water bath during pre and post – monsoon period. One third of these water sample exhibit change from Ca-Mg-HCO_3 & Na-HCO_3 type to mixed & NaCl type showing end product water , One third sample show change in water type from Ca-Mg-HCO_3 to $NaHCO_3$ type as a result of base exchange phenomenon and the remaining water samples change from mixed & NaCl type to Ca-Mg-HCO_3 type exhibiting recharging water.

The percentage of water samples showing change in water type from pre to post monsoon period is depicted by bar diagram (Fig.1). A Marked increase in NaCl type and decrease in $CaMgHCO_3$ type with no change in $NaHCO_3$ type water is clearly evident.

The increasing trend of electrical conductance (EC) from pre to post monsoon season show a considerable increase in salinity for shallow ground water from the study area (Fig.2). Salinity tends to increase in deep ground water sample as well, but to a lesser extent (Fig.3).

The effect of monsoon on concentration of cation in shallow ground water of Aligarh city show 36%, 43% & 57% increase in HCO_3, Cl, SO_4, values respectively (Fig.4), whereas HCO_3, Cl, & SO_4 values are found to increase in 75% , 50% & 25% water samples respectively from deep ground water aquifer (Fig.5)

The effect of monsoon on concentration of anions in shallow ground water of Aligarh city show 64% samples having increased (Ca & Mg) values 36% sample having increased Na values (Fig.8) , However ,Ca, Mg & Na, values are found to increase in 25 % , 100% & 50% water sample respectively from deep ground water aquifer (Fig.9).

This change in salinity, concentration of cations and anions from pre- monsoon to post monsoon season is due to passage of percolating rain water through the soil zone which dissolves secondary evaporates and various other ions from the mineral deposits and results in loading of ground water.

Conclusion

In the study area of Aligarh city for shallow aquifer system the salinity as observed from electrical conductance values is seen to increase markedly from pre- monsoon to post – monsoon season. The major cation and anions also exhibit remarkable increase in the values. This increase in the values of various constituents is due to the rain water which carries the dissolved ion from the weathering of soil mineral or the residue left behind by evapotranspiation. pre- monsoon to post – monsoon period show change in water quality of the area from Ca- Mg-HCO_3 & Na- HCO_3 type to NaCl type show end product water , Ca-Mg-HCO_3 to Na-HCO_3 type exhibiting Base exchange water and Na-Cl to Ca-Mg-HCO_3 type indicating recharging water

References

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Biographical details of the Author

Indu Saxena post graduated in physical chemistry from the University of Lucknow in 1992. She obtained a PhD. in 2001 in physical chemistry at the University of Lucknow. In 2004 she joined Lucknow University and is working there as an Assistant Professor in Chemistry Department.