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GROUND WATER QUALTY IN SOME VILLAGES OF SHAHAPUR TALUK, YADGIR DISTRICT, KARNATAKA, INDIA

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ABSTRACT:

Quality of water is an important criterion for evaluating the suitability of water for drinking and irrigation. The physico-chemical status of water for drinking and irrigation. The physico-chemical status of water samples from eight-major parts of 4-villages in Shahpur taluk. The sampling points were selected on the basis of their importance. The physic-chemical parameters were extensively monitored for one year of study period, from October-2012 to September – 2013. The physic-chemical parameters like, temperature , p^H, Electrical conductivity (EC), total dissolved solids (TSD), turbidity, dissolved oxygen (DO), Free carbondioxide (CO_2), total hardness (TH), Calcium (Ca^{++}), Magnesium (Mg^{++}), Chloride (Cl^-), fluoride (F^-), Nitrate (NO_3), of bore well was determined. The results were compared with standards prescribed by WHO (1973) and ISI (10500-91), it was found that some of the water quality parameters were above the permissible limit and some were not.

Key words: Groundwater, Physico-chemical parameters, bore well, Shahpur taluk.

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INTRODUCTION:

Natural resources are the important health of our country, water is one of them. Water is a wander of the nature. “No Life without Water” is a common saying depending upon the fact that water is the one of the naturally occurring essential requirement of all life supporting activities. (Ayibatele et.al.,-1992).

Approximately 71% of the earth’s surface is covered with water. Freshwater is found as underground water in large reservoirs surrounded by rock called aquifers. This groundwater has long been considered as one of the purest forms of rural and semi urban people. Majority of people in India depends upon freshwater supplies from dug wells, ponds, bore wells, springs and the like. Apart from domestic use, these sources provide the water essential for irrigation and small scale industries. The availability of water through surface and groundwater resources has become critical day by day. Only 1% part is available on land for drinking, Agriculture, domestic, power generation, industrial consummation, transportation and waste disposal. (Mishra K.R., et.al, 2002).

The addition of various kinds of pollutants and nutrients through the agriculture runoff, agency sewage, industrial effluents etc., in to the water bodies, brings about a series of changes in the physic-chemical and characteristics of water, which have been the subject of several investigations. (Mahananda M.R.et.al.,-2010).

Prolonged discharge of industrial effluents, domestic sewage and solid waste dump causes the groundwater to become polluted and created health problems. (Raja R E, Lydia Sharmila et.al, 2002). Hence, there is always a need for and concern over the protection and management of groundwater quality, (Patil P.R, Badgujar S.R. et.al, 2001).

Heavy metals are priority toxic pollutants that severely limit the beneficial use of water for domestic and industrial application. (Petrus R and Warchd J.K. 2005).

The lakes have complex and fragile ecosystem, as they do not have self cleaning ability and therefore readily accumulate pollutants. (Lokeshwari H and Chandrappa G.T.2006). The most of water bodies in India needs to be treated before using it in domestic applications by various means. Groundwater contains high amount of various ions, salts etc. So if we were using such type of water as potable water then it leads to various water-borne diseases. (Arvnabh Mishra, Vasishta. Bhatt et.al, 2010). The quality of water is vital concern for the mankind, since it is directly linked with human welfare. Therefore, monitoring the quality of water is one of the essential issues of drinking water management. (Shama sehar, Iffat Naz, et.al, 2011).

Considering the above aspects of groundwater contamination, the present study was undertaken to investigate the impact of the groundwater quality water samples of four villages of Shahpur taluk of Yadgir district, Karnataka, India. Thus, in this research work an attempt has been made to assess the physical and chemical parameters of groundwater. The analyzed data were compared with standard values recommended by WHO (World Health Organization -1993). The literature survey reveals that no groundwater quality studies are made in this region so far.

Hence the present study was planned and undertaken, 4-villages of Shahpur taluk: Gogi-K, Gogi-P, Hoskera and Hattigudur. These sites selected were different areas in each village for sample collection.

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MATERIALS AND METHODS:

Groundwater samples were collected in polythene bottles. Date, time of collection and source of water and locality of the area were recorded properly. From each of the sampling site, water samples were collected for physic-chemical analysis, temperature and P^H were determined immediately at the sampling station. The samples were taken to the laboratory as early as possible and kept for further analysis. Usually 2-litres of sample were sufficient for analysis of physic-chemical parameters.

Analysis was caused out for various water quality parameters, using standard method.(APHA-American Public Health Association, 17th Ed.1989),(Trivedy R.K and Goel P.K., 1986).

RESULTS AND DICUSSION:

The various physico-chemical characteristics were analysed for groundwater from 8-different sampling stations. The details of the results were summarized in table -2.

CLIAMATE :-

The area under the research work, there is a rapid increase in temperature, after the month of January, April is the hottest month. The climate of the year is divided in to four seasons Viz : hot season from March to May: South-West monsoon from June to September; post-monsoon from October to November.

WATER TEMPERATURE:

Generally, the weather in study area is quite hot, however the water temperature plays an important factor which influences the chemical, bio-chemical characteristics of water body the maximum temperature of 30^0 c was recorded in may -2013 and minimum temperature of 22^oc was recorded in month of December in the year 2012. Water temperature in summer, was high due to low water level, high temperature and clear atmosphere. (Salve and Hiware -2008).

TURBIDITY IN NTU:

In most waters, turbidity is due to colloidal and extremely fine dispersions. The turbidity values varied between 1.39 NTU to 7.15 NTU and found within the limits prescribed by ISI (10500-91).

TOTAL DISSOLVED SOLIDS (TSD):

Total dissolved solids indicate the salinity behaviour of groundwater. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/l is also allowed. TDS values varied from 51.0 mg/l to 173.0 mg/l. The sampling points showed lower TDS values than the permissible limit given by ISI.

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P^H:

The P^H value of water source is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkalinity. Most of the biological and chemical reactions are influenced by the P^H of water system. In the present study all the groundwater samples have P^H values between 6.0-8.0, while WHO is between 7.0-8.5. The sampling stations of Gogi-k-S1,S2 , Gogi-P-S3,S4 and Hoskera S5,S6 have lower value of P^H than the permissible limits. If P^H is beyond the permissible limit, it damages the mucous membrane of cells.

ELECTRICAL CONDUCTIVITY (EC) :

EC is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. EC values were in the range of 82.8 to 365.0 micro.ohms/cm, indicating the presence of low amount of dissolved inorganic substances in ionised form.

FREE CARBONDIOXIDE (FREE CO_2) :

The value of free co_2 ranges from 6.6 mg/l. The maximum value 13.2 mg/l. The maximum value 13.2 mg/l was recorded in the month of December (Winter) and minimum value (6.6 mg/l) in the month of March (Summer). This may be depends upon alkalinity and hardness of water body. The value of co_2 was high in December. This could be related to the high rate of decomposition in the warmer months.

DISSOLVED OXYGEN:

Dissolved oxygen is important parameter in water quality assessment and reflects the physical and biological processes prevailing in the water. In natural waters, DO values are varying a according to the physico-chemical and biological activities. The DO values of study area are above the permissible limits of WHO (6PPM). The ranges of DO have been found in between 7.00 mg/l to 14.35 mg/l.

TOTAL HARDNESS (TH) in mg/l:

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water. Hardness of water mainly depends upon the amount of Calcium or Magnesium salts or both.

The hardness values shown range from 132.0 mg/l to 228.0 mg/l. The values for sample from all sampling stations were below the prescribed limit.

CALCIUM (Ca^{2+}) in mg/l:

Calcium are directly related to hardness. Calcium concentration ranged between 6.8 mg/l to 112.0 mg/l, and found above permissible limit of ISI, sample stations of Hoskera – S_5, S_6 and Hattigudur S_7.

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MAGNESIUM (Mg^{2+}) in mg/l:

Magnesium are directly related to hardness. Magnesium content in the investigated water samples was ranging from 20.008 mg/l to 41.13 mg/l. Which are found above and within the permissible limits of WHO (ppm).

CHLORIDE Cl^- in mg/l :

The Chloride concentration serves as an indicator of pollution by sewage. People accustomed to higher chloride in water are subjected to laxative effects. In the present analysis, chloride concentration was found in the range of 112.0 mg/l to 467.6 mg/l.

Chloride occurs naturally in all types of water. Chloride in natural water results from agricultural activities, industries and chloride rich rocks. High concentration of Chloride is due to invasion of domestic wastes and disposals by human activities. In the study areas chloride level is above and below the permissible limit of WHO (200 PPM), which indicates high concentration of chloride present in Hoskera- S_5 and $S_{6,}$ and remaining stations indicates below the permissible limit.

FLOURIDE (F^-):

Fluoride occurs as fluorspar (fluorite) rock phosphate, phosphorite crystals ect. In nature. Among factors which control the concentration of fluoride are the climate of the area and the presence of accessory minerals in the rock mineral assemblage through which the groundwater is circulating.

In this study, the fluoride concentrations of the some sampling stations have higher than the permissible limit of WHO (1.00 mg/l). The source of fluoride in these water samples may be weathering of rocks, phosphatic fertilizers used for agriculture or the sewage sludge. The percolation of phosphatic fertilizers from the agricultural runoff from the nearby lands and discharge of domestic wastes from the surrounding industries increases the fluoride values.

This study shows the all values are higher than the permissible limit of WHO (1.0 ppm) except Hoskera-S_6 and Gogi-P-S_4, the concentration found during study period are between 0.8 ppm to 2.00 ppm.

NITRATES:

The high nitrogen content is an indicator of organic pollution. It results from the added nitrogenous fertilizers, decay of dead plants and animals, animal urines etc. They are all oxidised to nitrate by natural process and hence nitrogen is present in the form of nitrate. The increase in one or all the above factors is responsible for the increase of nitrate content.

The groundwater contamination is due to the leaching of nitrate present on the surface with percolating water. This study shows the concentration of nitrates found during the study period are between – 0.0 to 49.0 mg/l.

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CONCLUSION:

The present study was undertaken with an aim to analyze certain physic-chemical characteristics in the groundwater samples of some villages in Shahpur taluk. Samples were collected from 8-different locations of Shahpur taluk analyzed monthly, for P^H, turbidity, TDS, TH, EC, Cl^-, and CO_2 using standard procedures. (APHA, Trivedi).

This analysis reveals that Ca^{2+}, Mg^{2+}, F-, NO_3^-, and DO exceed the permissible limit prescribed by WHO and ISI (10500-91), in most of the groundwater samples.

From obtained result it is suggested to monitor the groundwater quality and assess periodically to prevent the further contamination.

TABLE: 1: Sampling Location in Some Villages Of Shahpur Taluk:-

SERIAL NO.	SAMPLE LOCATIONS	SOURCE	SAMPLE NUMBER
1	Gogi-K: Near samudaya bhavan	Bore well (Hand pump)	S_1
2	Gogi-K: Near Darga	Bore well (Hand pump)	S_2
3	Gogi-P: Beside post office	Bore well (Hand pump)	S_3
4	Gogi-P: Near water purifier.	Bore well (Hand pump)	S_4
5	Hoskera: Near Hanuman temple	Bore well (Hand pump)	S_5
6	Hoskera: Near Govt. school	Bore well (Hand pump)	S_6
7	Hattigudur : Near Govt. School side	Bore well (Hand pump)	S_7
8	Hattigudur : Near Anganwadi	Bore well (Hand pump)	S_8

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TABLE: 2: Average results of the physic-chemical parameters of different sites in Shahpur taluk surrounding villages:

PARAMETER	SAMPLING POINTS IN SHAHPUR TALUK VILLAGES							
	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
TEMPERATURE	24^0 C	22^0 C	25^0 C	24^0 C	27^0 C	30^0 C	24^0 C	27^0 C
P^H	6.5	6.9	8.0	6.8	6.0	6.4	7.0	7.5
ELECTRIC CONDUCTIVITY	114.8	131.3	118.2	105.3	82.8	365.0	225.0	205.0
TOTAL DISSOLVED SOLIDS	72	63	63	57	51	173	164	79
TURBIDITY	4.15	7.15	4.69	7.15	5.70	1.39	3.60	6.70
FREE CO_2	6.6	8.8	13.2	12.46	8.8	8.1	10.7	12.46
DISSOLVED OXYGEN	14.05	9.37	14.35	13.24	7.65	7.00	14.05	8.20
TOTAL HARDNESS	144.0	188.0	132.0	228.0	184.0	224.0	142.0	175.0
CALCIUM	48.0	40.0	18.6	6.8	102.4	112.0	110.0	40.79
MAGNESIUM	23.42	36.112	27.66	40.79	20.008	27.328	41.13	30.38
CHLORIDE	112.0	156.8	114.8	114.7	113.8	467.6	250.0	237.0
FLOURIDE	2.0	1.5	2.0	1.0	1.8	0.8	1.2	2.0
NITRATE	20.0	42.0	47.0	0.0	48.0	49.0	42.2	43.25

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