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Corrosivity of Groundwater Sample of Heeranagar Village of Neemkathana Block of Sikar India

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Abstract: ***Heeranagar village of Neemkathana block is over-exploited, highly irrigated and due to the arid zone water table is much below. The aim of the present study is to analyze the effect of overexploitation on corrosivity. For the assessment of groundwater corrosivity within period from Jan-2022 to Dec-2022, by the Physico-chemical analysis of groundwater samples collected from the bore well. In the present study corrosivity of water is selected for the determination of suitability of water source for domestic uses and to avoid the impacts of side effects of corrosion due to storage and supply of water for domestic purposes.***

Keywords: WHO, BIS, TDS, Aggressive Index Physico-Chemical, Human health

1. Introduction

Groundwater (GW) belongs to all subsurface water, including saturated and unsaturated zones (Akhtar et al.2020). Suitability of groundwater depends on the groundwater chemistry for domestic, drinking, industrial, and irrigation use (Egbueri et al.2020a; Xiao et al.2019; 2021). Use of metallic water storage and distribution structures in homes and industries can reduce the quality of water through scaling and corrosion effects (Singley et al, 1985). The low pH of the water shows elevated corrosivity (Agatemor & Okolo 2008). An assessment by the NAWQA Project of more than 20, 000 wells nationwide showed that 25 states have groundwater that either has high or very high potential to be corrosive. The states with the largest percentage of wells with potentially corrosive groundwater are located primarily in the Northeast, the Southeast, and the Northwest. Seven indices, namely, corrosivity ratio (*CR*), Langelier saturation index (*LSI*), Ryznar stability index (*RSI*), Puckorius scaling index (*PSI*), Larson-Skold index (*LS*), Revelle index (*RI*) and chloride sulfate mass ratio (*CSMR*), may be applied to know the groundwater suitability for domestic industrial purpose. Storage and supply of water depends upon the scaling and corrosive nature of water. More the value of corrosivity reduces the storage and supply capability in metal pipes.

2. Method

Aggressive index (AI) method is used for the assessment of corrosivity. The Aggressive Index as a part of Standard C-400, which is developed by the American Water Works Association (AWWA), indicates the corrosive tendency of water (Trenchless Pedia, n. d.). The AI is dependent on three physico chemical parameters pH, total hardness (as per $CaCO_3$), and total alkalinity (HCO_3).

$$AI = pH + \log (A * H)$$

Where A is Total alkalinity and H is the total hardness of water.

Table1: Aggressive Index value and class of groundwater

	Aggressive Index Value	Class of water
Aggressive index (AI)	AI>12	Non-aggressive/ Non corrosive
	$10 < AI < 12$	Moderately aggressive
	AI< *10*	Very aggressive/Corrosive

3. Results and Discussions

Assessment of groundwater of Heeranagar village in Neemkathana block

Groundwater samples from Heeranagar village were collected for the assessment period of Aug-2021 to July-2022 and analyzed for selected physico-chemical parameters. The results are shown in the table 2.

Table2: Test results of groundwater of Heeranagar village

Water testing of Heeranagar village in Neemkathana block			
Parameters. / Month	Ph	Total alkalinity, mg/L	Total hardness, mg/L
Aug-20	8	340	370
Sept-20	8	330	290
Oct-20	7.9	340	260
Nov-20	8	360	510
Dec-20	8.2	330	300
Jan-21	7.6	320	310
Feb-21	8	440	380
Mar-21	7.9	260	180
Apr-21	7.4	290	150
May-21	7.9	260	180
Jun-21	7.6	260	180
Jul-21	7.9	250	160

Table3: Aggressive Index of groundwater of Heeranagar Village

Month	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21
AI	13.1	12.98	12.85	13.26	13.2	12.6	13.22	12.57	12.04	12.57	12.27	12.5

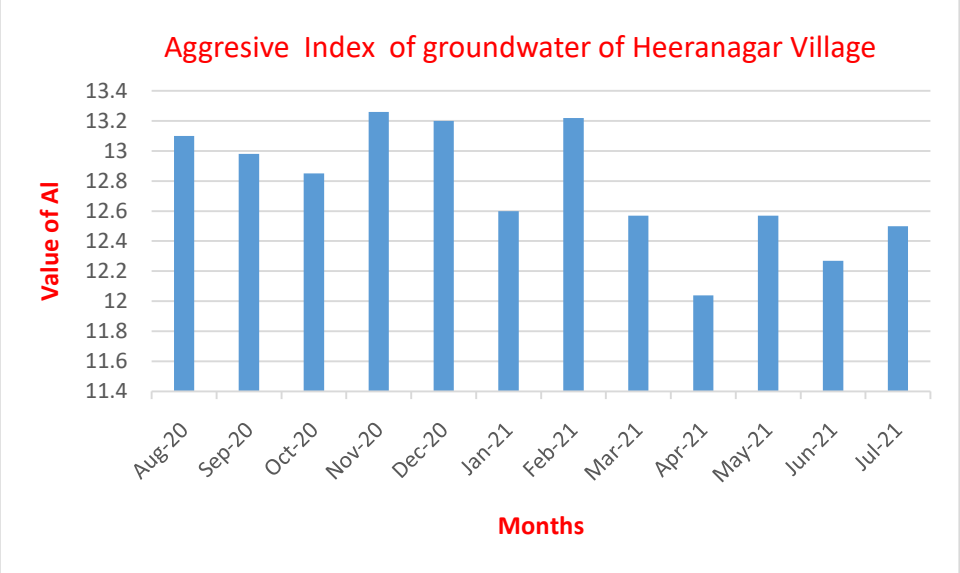

Figure1: Aggressive Index of groundwater of Heeranagar Village

Analysis and calculation shown in table and figure of groundwater sample for the assessment period for the village indicate that the value of aggressive index ranges from 13.26 to 12.04. These values make the groundwater non aggressive and noncorrosive.

4. Conclusion

Depletion of groundwater table, due to the overexploitation for agricultural and domestic uses of the groundwater sources, changes the physicochemical parameters values and also water quality. The results for total alkalinity and total hardness are more than the BIS limit which reduces the portability. Aggresive index values for the assessment period are above 12 so groundwater of Heeranagar village is non aggressive and noncorrosive in nature, so can be stored and supplied through metal pipelines. The groundwater of Heeranagar village is found suitable for human health for the assessment period. But the values is near to 12 for the assessment period so a continuous monitoring of quality is required for the source to be used for domestic purposes.

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