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Studies and Analysis of Specification Non-Metal Ions in Industrial Ground Water Around Vijayawada, Andhra Pradesh, India

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ABSTRACT
Ground water quality near industrial sites is a major concern because it has a direct impact on human health and irrigation. The quality of ground water in the vicinity of Vijawada's industrial districts is examined in this paper. Physico-chemical characteristics such as pH, electrical conductivity, and total dissolved solids were measured in water samples.The goal of this study is to determine the nonmetal ions in industrial groundwater in the Vijayawada area. The landfills in Vijayawada city were utilized for dumping industrial and domestic waste, although they were all located on the Krishna River's bank. Sampling was done in various industrial sites surrounding Vijayawada for the current groundwater quality investigation.
Keywords: pH, electrical conductivity, and total dissolved solids

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INTRODUCTION

In both rural and urban locations, groundwater is the most important source for domestic and drinking water. Furthermore, it is the primary supply for both agriculture and industry. It has been regarded as a reliable supply of clean water. Because of contaminants from various sources, the aforesaid scenario is rapidly and alarmingly altering. Even though water can be polluted naturally, the quality of ground water might vary from place to place due to a higher concentration of minerals in the soils and rocks. Untreated municipal and industrial waste streams, pesticides, fertilizers, sewers, and landfill regions are all possible sources of groundwater pollution, in addition to rapid population increase and rising living standards.
The purpose of this research is to find out how many nonmetal ions are present in industrial groundwater in the Vijayawada area. Although they were all located on the Krishna River's bank, the landfills in Vijayawada city were used for dumping industrial and domestic garbage. For the current groundwater quality investigation, sampling was done in various industrial areas around Vijayawada.
Groundwater calculations without contamination assessments may be erroneous in sensitive and overexploited aquifers. When considering basin-scale partitioning, the groundwater supply is conditionally renewable. [1] Because the concentration of F in the unsaturated zone rises with depth, real-time modelling of soil moisture movement in the unsaturated zone requires an examination of vertical F fluctuation to better prediction of rock-water interaction and virtual groundwater loss. More information about the aquifer system is provided. [2] As the alginate was immobilized with the natural polymer for the breakdown of the antibiotic tetracycline (TC), electrochemically synthesized magnetite nanostructures (ESMNPs) and nano-carbon black (NCB) were added as metal and non-metal activators, respectively. The bioassessment was also subjected to response surface methodological optimization. There was also an ECOSAR-based bioassay of intermediates and potential degradation routes. [3] In comparison to Nile freshwater irrigation, the presence of six PTMs (Cr, Co, Cu, Pb, Ni, and Zn) in alluvial soils, berseem plants, and groundwater was observed in an area south-eastern the Nile Delta (Egypt) subjected to long-term wastewater irrigation, i.e., agricultural drainage water and mixed wastewater. Overall, the amounts of Co, Cu, Ni, and Zn in the soils of the three test locations, as well as Pb in MWW-irrigated soils, were found to be higher than their usual proportions in the earth's crust, indicating possible dangers.
Total hardness, Electrical Conductivity, Total hardness, calcium and magnesium hardness, DO, BOD, COD, Sodium, Potassium, and Forum were all measured in ground and surface water around industrial areas in and around [4]. Vijayawada was not a fan of the acceptable drinking water quality standard. As a result, industrial effluents leaching and overflowing have been assessed to have harmed the city's existing drinking water quality. [5] Fluoride contamination of drinking water and groundwater has already

reached dangerously high levels. To solve this situation, people must pay instant attention and participate actively. The maximum fluoride concentration in drinking water for any region is determined by the region's dietary habits, annual daily temperature, natural environment, and exposure level. Material availability, cost-effectiveness, and fluoride removal level, as well as technical difficulty, must all be considered in refinement technology. [6] The quality of groundwater samples in the Owerri municipality and neighboring vehicle scrap markets was assessed using risk and contamination models. According to hierarchical cluster analysis, two different sources poisoned the soil and water samples (HCA).A number of higher than 100 on the heavy metal contamination index (HMPI) in the tests indicates that the groundwater is unfit for human consumption.

The appropriateness of groundwater for drinking in a south Indian industrial hub was estimated using physicochemical parameters of soil samples taken from 70 different wells over the course of one monitoring year (2017–2019). (Vello). [7] Before the SW monsoon, 78.6% of groundwater tests were "poor" for consumption, whereas 82.85% of groundwater samples were "awful" during the NE (North East) monsoon season (around October 20). Sodium, potassium, calcium, chloride, sulphate, and nitrate concentrations surpassed WHO's maximum allowed limits for ingestion in both the rainy and dry seasons. [8] In the Indian state of Telangana, groundwater contamination is the most serious threat to public health. Fluoride levels in Nalgonda are high, with an average fluoride concentration 5.76 times higher than the 1.5 mg/L drinking water limit. As a result, Telangana's rural areas require special attention and clean drinking water. [9] The dynamics of Vijayawada's urban building density were efficiently captured by an urban sprawl research using spatial metrics, allowing the yearly urban expansion rate to be determined. Multi-ring bumpers were used to investigate cities' unequal expansion. Vijayawada's annual growth rate is at the price of the city's green cover. It jeopardises healthy and sustainable living standards in every way. [10] As a result, determining the amount of groundwater available for drinking is critical; the groundwater in the research area is polluted, and numerous physico-chemical parameters such as turbidity, pH, total dissolved solids, and so on have been measured. and total were determined using groundwater samples collected from the selected regions to reveal this issue. In comparison to the results from the study area and the BIS and WHO criteria, groundwater should be cleaned and protected from contamination to some extent before consumption.

MATERIAL AND METHODS

Sample Analysis

Vijayawada is the third largest city in Andhra Pradesh. On the banks of the Krishna River, it is one of Andhra Pradesh's commercial hubs. At 16.52 degrees north latitude and 80.62 degrees east longitude, the city is located. The southwest monsoon (June-September) is responsible for 68% of rainfall, while the northeast monsoon (October-December) is responsible for 22%. According to the 2011 census, VUA has a population of 1.49 million people. The Krishna River's groundwater source, which includes infiltration galleries, meets around 40% of the water demand. The study area is in Vijayawada city, namely in the north east (auto nagar), south west (morampudi, pedavadlapudi, and atmakuru), and north west (morampudi, pedavadlapudi, and atmakuru) (Ibrahim patnam).Fig. 1 shows the research locations in and around Vijayawada: Morampudi, Atmakuru, IDL Ibrahimpatnam, Autonagar, and Pedavadlapudi.

Fig. 1. Study area for groundwater analysis

Geology and Soil Type in the Study Area

There are a variety of lithological formations in the research region, ranging in age from Archaean crystalline to alluvium. Depending on the existence of diverse rock formations, the area can be split into three lithological provinces. The crystalline group of rocks, which includes chondrites, peninsular gneisses, Dharwars, and the Proterozoic group of rocks, occupy the western and northern parts of the study area, while Gondwana sandstones occupy the northeastern and central parts, and River and Coastal Alluvia occupy the eastern and southern parts. In the research region, there are four main types of soils: 57.6% black cotton soils, 22.3 percent sandy clay loams, 19.4% red loamy soils, and 0.7 percent sandy soils. Sandy soils form a bobble along the Krishna River's coastal section.

Table 1: Sampling Stations

S.NO	Sampling Station	Location
1	Station 1	Bore well from yerrabalem site
2	Station 2	Bore well from Dolas Nagar Site
3	Station 3	Bore well from Acharya nagarjuna University site (Control System)

Non-Metal Industrial Ground Water around Vijayawada

Vijayawada's metropolitan city has a mix of small and large industries in various locations. Vijayawada's major industries include agro-industry, autos, construction units, hardware, textile, chemical, and power plants. Auto Nagar and Ibrahimpatnam are two well-equipped industrial parks in the city. The majority of industries are concentrated in the Industrial Estate and Auto Nagar sectors. Milk processing is another important sector in the city, which is located in the heart of the city. Thermal power plants from VTPS, NTPC, and LANCO are also located near the city. The city's groundwater has become considerably poisoned as a result of growing industrialization.

The Non-Metal ground water is an indexing approach that depicts the combined effect of various Non-Metal on the overall water quality. Weights (Wi) between 0 and 1 were chosen for each Non-Metal in the Non-Metal pollution index. For each measure, the main rating is inversely proportional to the suggested standard (Si) and is based on the relative relevance of specific quality aspects. Calculating the quality index of water can be used to determine its quality and suitability for drinking.

Physico-Chemical Analysis

All of the gathered materials were examined in the lab using industry-standard procedures. For the purpose of analysis, standard solutions were made with A.R. grade chemicals and double-distilled water. A total of three sampling stations were chosen for collecting samples from bore-wells in Guntur's industrial areas throughout a 22-kilometer radius, with the third station, namely, pH, electrical conductivity (EC), total dissolved solids (TDS),were all assessed in the samples.

RESULTS AND DISCUSSION

The results of physicochemical analysis of ground water over two full annual cycles are shown in Table 3. All of the stations' physicochemical parameters were discovered.

Table 2: Physico-chemical analysis of groundwater quality at three sampling stations

S.NO	Parameters	Station-I	Station -II	Station-III
1.	Electricity Conductivity	355.471±214.29	380±274.64	240.75 ±118.11
2.	Total Dissolved Solids (TDS):	984. 25 ±19.72	1247±34.16	580.75±79.89
3.	Total Hardness	406.33±63.02	408±166.93	281.16±62.04

pH

The pH of a water body is one of the key indicators of pollution. The pH of natural water can provide important information about many chemical and biological processes and has an indirect relationship with a variety of impairments. The concentration of hydrogen ions is measured by pH, which is a scale of acidity and alkalinity in water. 1. Formalized paraphrase at station-I, the pH of the ground water was closer to neutral, 7.3120.186. The pH of all of the samples was within the BIS drinking water standards. Throughout all three seasons, the pH was found to be near neutral to alkaline and within the BIS specified range of 6.5-8.5 for drinking water.

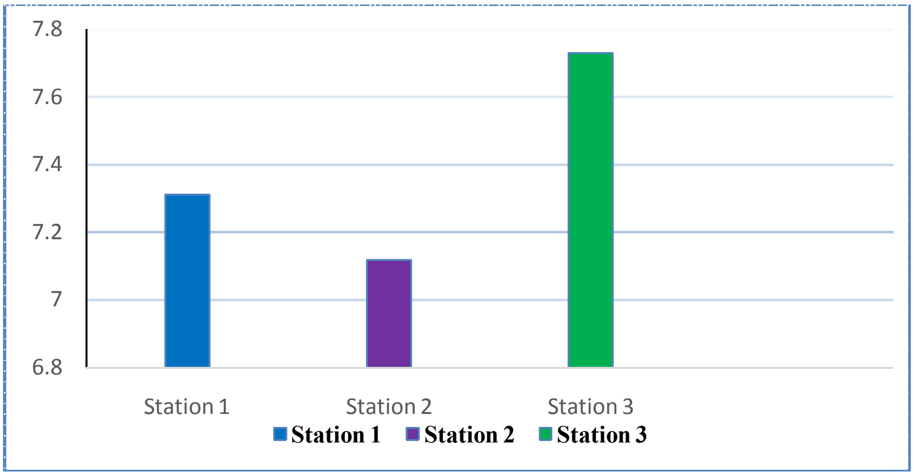

Fig.2: P^H values for each station

Electrical Conductivity (EC):

The ionic content of water is measured by the EC. Micro-Siemens per centimetre10 is the most used unit of conductivity measurement. The groundwater's Electrical Conductivity was somewhat higher than the BIS's maximum allowable limit of 750 mhos/cm. Electrical Conductivity reached its lowest point in October 2015, and its highest point in February 2016. Summer had the highest electrical conductivity, followed by wet and winter seasons.

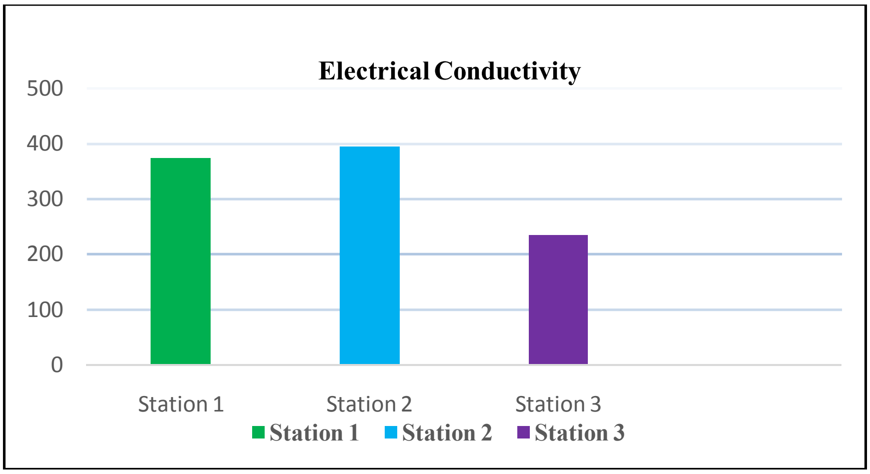

Fig.3: Electrical conductivity values for each station

Total Dissolved Solids (TDS):

TDS (Total Dissolved Solids) is a measure of groundwater salinity (TDS). Drinking water with a total dissolved solids (TDS) level of more than 500 ppm is not advised15. The BIS permitted limit for total dissolved solids (TDS) in ground water samples obtained in the research region was surpassed on average. The lowest total dissolved solids value was reported in January 2017, and the highest total dissolved solids value was recorded.

Table 3: Total dissolved salts are used to categories ground water samples.

Classification of ground water	Total dissolved salts in mg/L
saline-free	< 1000
Slightly salty	1000-3000
Moderately Salinity	3000-10000
Very salty	>10000

Total Hardness:

Water hardness is a water quality that hinders soap from lathering and raises the boiling point of water. The hardness of water is determined by the amount of calcium or magnesium salts present. The hardness levels displayed range from 470 to 500 mg/L. One of the most essential features of drinking water is its hardness. Urolithiasis can be caused by hardness. The total hardness of the bore well samples in the studied areas is within the prescribed range.

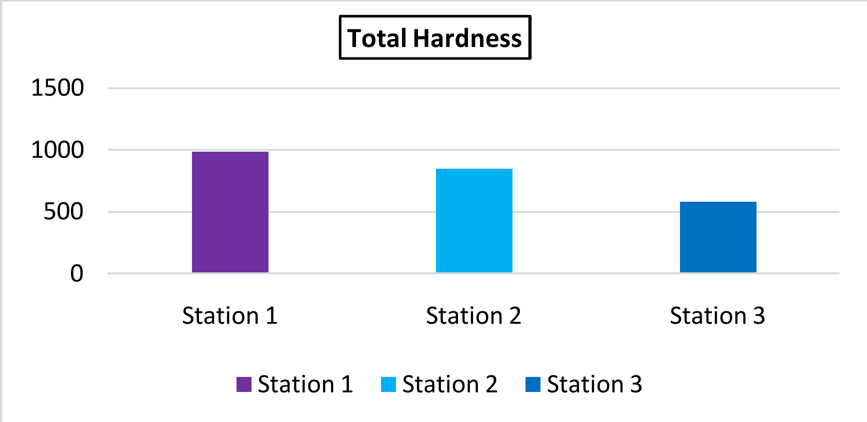

Fig.4: Total Hardness values for each station.

CONCLUSION

The groundwater quality in Vijayawada's industrial districts was found to be heavily contaminated by numerous forms of toxins from the industries, according to an analysis. According to the findings of this study, total dissolved solids, total hardness, electrical conductivity were all measured in groundwater samples in the peripheral zones around industrial locations and were all very high. Although they were all located on the Krishna River's bank, the landfills in Vijayawada city were used the non-metal industrial ground water around Vijayawada is assessed for depositing industrial and domestic trash. For the current groundwater quality investigation, sampling was done in various industrial areas around Vijayawada.As a result, in industrial areas throughout the city, a careful management and consideration of all seasonal factors and site specifications must be attempted through the implementation of a sound and long-term plan. The physico-chemical parameters were found to be similar at each station.

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