IJERT
ISSN : 2278-0181
International Journal of Engineering Research & Technology

Analysis of Distribution of Nitrate in Ground Water of Osian Region of Jodhpur District

Dr. Sangita Purohit
Department of Chemistry
Vyas Institute of Engineering and Technology, Jodhpur
sangitapurohitharsh@gmail.com

Abstract—A chemical analysis of the ground water of Osian Region of Jodhpur district has been carried out to examine the suitability of water for drinking and irrigation purposes. Forty one water samples of the region were collected during pre- monsoon and post-monsoon seasons in the month of June and November 2013 respectively and Nitrate concentration of the samples was determined to assess the quality of water in the area. Concentration of nitrate was recorded 7.5 mg/L to 137.5 mg/L in pre monsoon and 5.0 mg/L to 125.0 mg/L in post monsoon season. The results were compared with standards prescribed by Indian government IS:10500, and the relative distribution of nitrate in the region is shown through a pie chart. This analysis can be useful for carrying out remedial measures for high nitrate concentration, region.

Key words: Water quality, Nitrate, Osian region, physico-chemical analysis.

I. INTRODUCTION

Water is essential to sustain life, but it also serves as the commonest route of transmission of a number of infectious diseases. The World Health Organization says that every year more than 3.4 million people die as a result of water related diseases, making it the leading cause of disease and death around the world [4]. The safe drinking water is defined as water with microbial, chemical and physical characteristics that meet guidelines of national standards, e.g. IS 10500 [3]. The quality of water is reflected through various physical, chemical and biological conditions, which are eventually influenced by natural and anthropogenic sources. Some of the water quality parameters like Ammonia, Lead, Arsenic, Nitrate etc may cause adverse effects on human health. Higher content of Phosphate, Nitrate, Ammonia and Iron are undesirable. In this work analysis is carried out for Nitrate component in the water.

Nitrogen is a major constituent of the earth's atmosphere; It is an essential element for the life of plants and animals.

It occurs in many different gaseous forms such as elemental nitrogen, nitrate and ammonia. Atmospheric nitrogen reacts with rainwater naturally, and results in the formation of nitrate and ammonium ions. While nitrate is a common nitrogenous compound due to natural processes of the nitrogen cycle.

Nitrate is formed by biochemical activities of micro organisms or added in chemically synthesized form in lithosphere or biosphere and enters in hydrosphere, all the environmental processes are interconnected. Due to high solubility of nitrate in water and slow retention by soil particles makes it the major component of ground water in areas of high nitrate formations.

Low level of nitrogen (in form of nitrate) is common in ground water and surface water. However elevated form of nitrate is caused by human activities such as increasing use of fertilizers and manure in agriculture, decayed vegetables, animal feedlots, municipal waste water and sludge disposal to land ,industrial discharge, organic waste is generated by Indian population and N- fixation from atmosphere by bacteria and lightening[1].

Nitrate is colorless, odorless and tasteless compound. According to Indian standard (IS 10500), its permissible limit is 45 mg/L [2]. It enters the human body through the use of groundwater for drinking and causes a number of health disorders namely methemoglobinemia or blue baby syndrome, gastric cancer, goitre, hypertension, etc., when present in high concentration in drinking water. The presence of nitrate in water not only effects the human health but also animals.

In this paper a chemical study seasonal variation of Nitrate compound of the ground water of Osian region of Jodhpur district has been carried out. To analyze, 41 water samples were collected during pre- monsoon and post-monsoon seasons in the month of June and November 2013 respectively and Nitrate concentration of the samples was determined to assess the quality of water in the area, so that remedial measures could be work out for high nitrate concentration.

II. EXPERIMENTAL SETUP

To analyze the distribution of Nitrate, 41 water samples were collected in sterilized plastic bottles from the different pockets of Osian region; the locality of samples collected is shown in TABLE-1. The concentrations of Nitrate in collected samples were examined through Phenoldisulphonic Acid (PDA) method. The principle of this method is that, 'Nitrate reacts with Phenol disulphonic acid to produce nitro derivatives that in alkaline solution

rearranges its structure to form yellow colored compound with characteristics that follows Beer's law'[2]. Then the concentration of NO_3^- is determined using visual method, by comparing color of the processed sample with color obtained by of standard (known concentration) solutions. Sample wise Nitrate concentration calculated through PDA method is shown in Table- 2, and the visual representation of seasonal variation in Nitrate concentration is shown in fig-1.

III. RESULT & DISCUSSION

It is observed that different agencies have developed standards for various uses for water. All these standards take in to account the effect on human health, vegetation as well as on quality of life consideration etc. However the standard differs in terms of maximum allowable concentration and accepted level. Hence it was felt that a common classification scheme, is necessary to know water quality status in terms of various important indicator parameters. Giving due consideration to all classification schemes, a general classification, as excellent, acceptable, slightly polluted and heavily polluted water is proposed, where in

- Excellent – Water quality is pristine.
- Acceptable -- Needs only disinfections.
- Slightly polluted -- It requires filtration and disinfections.
- Polluted -- It requires special / auxiliary treatment and disinfections.
- Heavily polluted --Water cannot be used for any purpose directly i.e. drastic treatment is required.

Water is contaminated, as the earth crust is loaded heavily with salts. Nitrate level is found 5 mg/L to 137. 5 mg/L. From the table -4 it is clear that 14 samples in pre and 19 samples in post monsoon fall in the category – I , 11 samples in pre and 13 samples in post monsoon fall in the in category – 2 , 11 samples in pre and 5 samples in post monsoon fall in the in category – 3, 3 samples in pre and 3 samples in post monsoon fall in the in category – 4, 2 samples in pre and 1 sample in post monsoon fall in the in category – 5, as shown in Table-3.

Visual representation of relative Nitrate distribution in study region in pre-monsoon and post-monsoon is shown in Fig-2 and Fig-3, respectively.

Present study shows that presence of high nitrate contents in the ground water of Osian Region. The source which do not have alternate water sources should be provided with treatment plants to eliminate the problem.

IV. CONCLUSION AND RECOMMENDATION

Present study shows that, Nitrate contents in some of the pockets of Osian region is high. These sources must be marked as *'not suitable for drinking'*. However the polluted water may be used for irrigation after treatment plants to eliminate or minimize the problem.

V. REFERENCES

1. U.S. Environmental Protection Agency (1979). Methods for Chemical Analysis of water and wastes, Method 353.3 U.S. Environmental Protection Agency, Washington, D.C.

2. Standard Methods for the Examination of Water and Wastewater; APHA, AWWA and WEF, 21st Edition, 2005.

3. Indian Standard Specifications For Drinking Water IS: 10500.

4. Voice of America News, October 29, 2009.

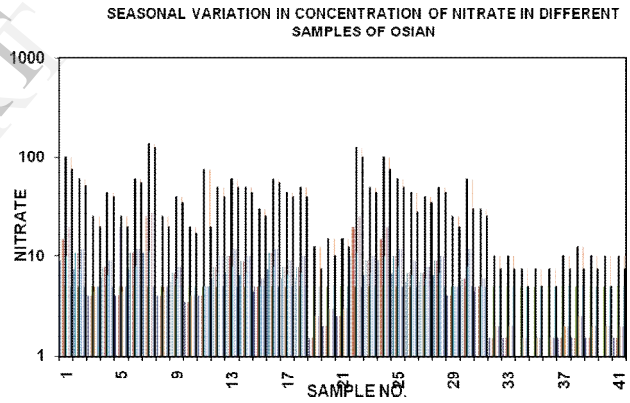

Fig 1: Seasonal Variation in Concentration of Nitrate Different samples of Osian

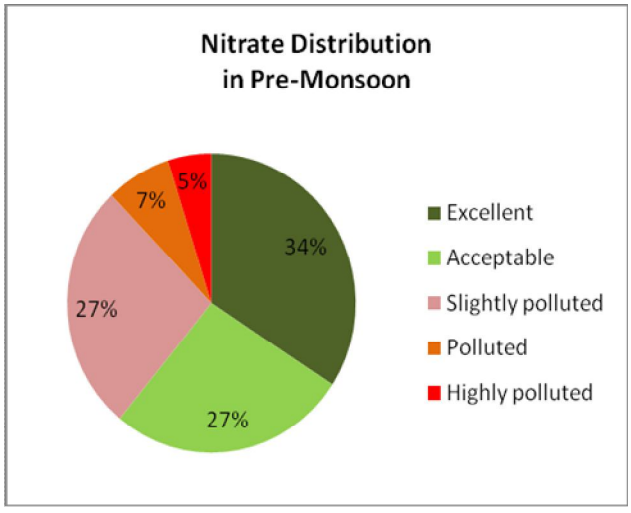

Fig 2: Nitrate Distribution in Pre-Monsoon

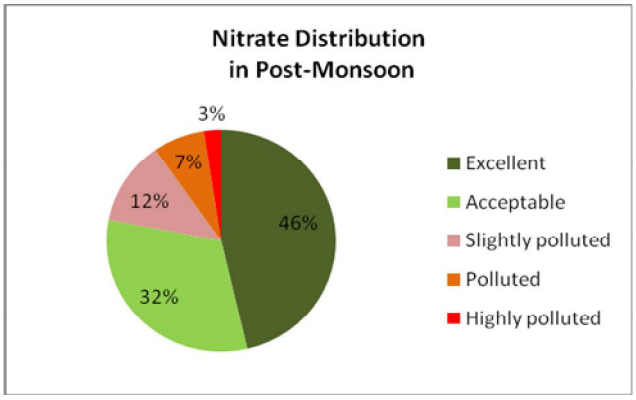

Fig 3: Nitrate Distribution in Post-Monsoon

TABLE- 1: WATER SAMPLES WERE COLLECTED FROM DIFFERENT POCKETS OF OSIAN REGION

S. No.	*Source*	*Type*	*S. No.*	*Source*	*Type*
1	Ujaliya,	Ow	22	Mathaniya, Mathaina	Ow
2	Oochiyara panchatat samiti,Osian	Ow	23	Nirmal bera, Mathaina	Ow
3	Ghatinav,Osian	Tw	24	Navoda bera, Mathaina	Ow
4	Devka bera,Osian	Ow	25	Premsukh ji Daga ka bera, Mathaina	Ow
5	Sirmandi (Birjaram singada),Osian	Tw	26	Water supply, Mathaina	Ow
6	Simardha baba ki samadhi,Osian	Tw	27	Padla bera, Mathaina	Ow
7	Vidhyalaya,Osian	Ow	28	Rathoron ka bera Gumansingh, Mathaina	Ow
8	Pashu mela maidan,Osian	Tw	29	Kotchala bera, Mathaina	Ow
9	Shri sachiyaya mat athiti grah,Osian	Tw	30	Kotchala bera nanakram, Mathaina	Ow
10	Mataji mandir road ,Osian	Hp	31	Nawada bera, Mathaina	Ow
11	Simardha baba ki samadhi,forest dept,Osian	Tw	32	Padla bera, Mathaina	Ow
12	Ashok kumar mali ,Geeta dham road, Tiwari	Ow	33	Gopji gahlot, Mathaina	Ow
13	Jagdish mali ,Geeta dham road Tiwari	Ow	34	Bhurji solanki, Mathaina	Ow
14	Sohan sankhla Tiwari	Ow	35	Manaram ji Tak, Mathaina	Ow
15	Sanwar ram ji mali Tiwari	Ow	36	Sumrapal tak, Mathaina	Ow
16	Pepa ram ji mali,geeta dham road Tiwari	Ow	37	Chandraram ji parihar, Mathaina	Ow
17	Pukhraj cOwdhry Tiwari	Ow	38	Kanwal ji gahlot, Mathaina	Ow
18	Sunil kumar siyol, Geeta dham road Tiwari	Ow	39	Jagraj tak, Mathaina	Ow
19	Phed ,Bijariya bawari road Tiwari	Tw	40	Kailash ji daga, Mathaina	Ow
20	Mohanramji mali Tiwari	Ow	41	Daga ka bera, Mathaina	Ow
21	Handpump Tiwari	Hp	***Notations: Ow:Open Well; Tw:Tubewell; Hp:Hand Pump***		

TABLE - 2: NITRATE CONCENTRATION IN PRE-MONSOON AND POST-MONSOON SEASON

Sample no.	*Nitrate concentration (mg/L)*		*Sample no.*	*Nitrate concentration (mg/L)*	
	Pre-monsoon	*Post-monsoon*		*Pre-monsoon*	*Post-monsoon*
1	100.0	75.0	22	125.0	100.0
2	60.0	55.0	23	50.0	45.0
3	25.0	20.0	24	100.0	75.0
4	45.0	40.0	25	60.0	50.0
5	25.0	20.0	26	45.0	35.0
6	60.0	55.0	27	40.0	35.0
7	137.5	125.0	28	50.0	45.0
8	25.0	20.0	29	25.0	20.0
9	40.0	35.0	30	60.0	30.0
10	20.0	17.5	31	30.0	25.0
11	75.0	20.0	32	10.0	7.5
12	50.0	40.0	33	10.0	7.5
13	60.0	50.0	34	7.5	5.0
14	50.0	45.0	35	7.5	5.0
15	30.0	25.0	36	7.5	5.0
16	60.0	55.0	37	10.0	7.5
17	45.0	40.0	38	12.5	7.5
18	50.0	40.0	39	10.0	7.5
19	12.5	7.5	40	10.0	5.0
20	15.0	10.0	41	10.0	7.5
21	15.0	12.5			

Table-3 DISTRIBUTION OF NITRATE

Class of water	*NO_3 (mg/L)*	*Pre-Monsoon*	*Post-Monsoon*
Excellent	<=20	14	19
Acceptable	45	11.0	13.0
Slightly polluted	60	11.0	5.0
Polluted	100	3.0	3.0
Highly polluted	>100	2.0	1.0