

Seasonal Variation of Nitrates and Alkalinity in Water Bodies at North-east region of Karad, Dist. Satara, India

Sneha S. Phadatare ¹, Prof. Sagar M. Gawande ²

P.G. Student M.E. (Environment), Dept. of Civil Engineering, A.B.S.P.'s Anantrao College Of Engineering And
Research, Parvati, Pune, India.¹

Professor and head of Department, Dept. of Civil Engineering, A.B.S.P.'s Anantrao College Of Engineering And
Research, Parvati, Pune, India.²

ABSTRACT: Water is very essential natural resource for sustaining life and environment that we have already available as a free gift of nature^[1-4]. Water is universal solvent. The different concentration of ions, minerals, other substances present in water that changes its physical, chemical and biological properties. The earth is combination of different geological, hydrological and climatic conditions. Geological conditions include type of soil, types of rocks, types of minerals, nature of terrain i.e. hilly area, valley etc. present in particular study area while in hydrological condition type of precipitation, recovery of water bodies, utilization of the water bodies are includes. Sometimes manmade activities depends on the land use pattern may be changes the water quality. e.g. the land utilized for agriculture purpose and if the agrochemicals are utilized for unscientific manner then the contamination of water bodies through runoff and percolation can be occurred. In this paper we had taken the North-east region of Karad which is about 90% agricultural lands for study purpose. By analysis of nitrates and alkalinity we get the present scenario of water bodies.

KEYWORDS: Water Bodies, manmade activities, quality parameters, water quality.

I. INTRODUCTION

Fresh water is most precious resource for survival on earth. It is not only essential for human beings but also flora and fauna. India is a tropical county with a vast diversity of climate, topography and vegetation. Though blessed with fairly high annual rainfall, it is not uniformly distributed in time and space resulting in bulk of the rainfall escaping as runoff. [5] The fresh water bodies present on earth is in very less amount. If we consider in percentage then out of 100 percent 99 % water bodies are in the form of saline water (seas and oceans) and 1% of fresh water bodies including ground water. It is strategically valuable as major and preferred source of drinking water. There are mainly two types of water bodies available on earth one is surface water bodies like river, lake, pond etc. and subsurface water bodies like ground water. We know water is universally solvent with capability of dissolving anything^[4]. The different water bodies contains different amount of concentration of ions, minerals or any other substances. From which the quality of water body was decided. They called as quality parameters from which nitrates and alkalinity is taken for analysis purpose for particular region. The study area includes villages Belwadi, Chinchani, Kharade, Kalgaon, and Targaon. The main resource of water is groundwater and in Kalgaon and Targaon Krishna river. These hydro -chemicals and their concentration is vary due to precipitation, surface runoff, interflow, groundwater flow, and pumped in and out outflows have a strong effect on river discharge and subsequently concentration of pollutants in water body^[5]. The main resource for living of people in study area is farming; maximum use of fertilizer is done by farmers in that land. From health concern we check the nitrates and alkalinity in study area to understand present condition.

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II. STUDY LOCATION

2.1 General

The study area is located at 17° 42' 29" north Latitude and 74° 34' 52" Longitude east. Geologically area is mainly covered by wide range of Basaltic lava flows of Upper Cretaceous – Lower Eocene age. These flows are part of the Plateau basalt of the peninsular part of India. Near Satara flows varying in thickness from 6 m to 83 m. Red boles are found imperersistently along the contact of most of the flows. The secondary minerals found in vesicles include zeolites, chert, chalcedony, quartz, agate and calcite found. The study area contains the various types of soil as black cotton soil, red soil, murum, brown soil and alluvial soil. Alluvium occurs in patches along banks of rivers like the Krishna. The thickness of alluvium varies up to 10 m. at places. It consist of beds of pebbles and boulders of trap and chert, silt and sand.in the western part , where laterite is extensively eroded and the reddish brown soil is conspicuous.

2.2 Climate and rainfall

The prevailing climate condition in study area has a tropical climate and temperature varies in the range 33°C-40°C in summer and 15°C-20°C in winter. The precipitation in this area mainly depends on North-East Monsoon.

2.3 Land use pattern

In study area maximum villager's main business is farming. There is about 90 % land is agricultural land. Cultivation in this area mainly depends on Krishna river basin. The major crops cultivated in this region are sugarcane, Bajra, Jowar, Groundnut, sunflower and in some areas turmeric. Remaining is 'Gaathan' i.e. for domestic purpose land.

2.4 Population (as per population census 2011)

The given in Table No. 1 gives idea regarding the total population in that area as per population census 2011. The table also includes literacy column that indicates the standard of living and mentality of people live there. If we compare between the average literacy of Maharashtra i.e. 82.34% and study area then it is observed that Kharade and Kalgaon villages are with more percentage of literacy.

Table no. 1. Showing population in study area as per population census 2011

Name of village	Population	Male	female	Literacy
Belwadi	811	427	384	78.67%
Chinchani	281	144	137	81.20%
Kalgaon	2423	1215	1208	82.99%
Kharade	1607	801	806	86.96%
Targaon	1869	924	945	81.79%
Total	6991	3511	3480	82.32 %

III. METHODOLOGY

Water samples are taken as per season wise i.e. rainy, winter and summer season. Water samples were collected from 10 different location points. Total five villages are taken under study area from which 2 samples are collected from each village the name of villages and the sampling location points are list out below. The type of sampling is location sampling procedure was adopted. The standard procedure was consider as per American Public Health Association (APHA)^[7] Location points were decided as per previous study and with consideration of all limitations.

List of name of location points as per villages and notification used are given below:

- 1) Belwadi - Ladi Mala, Belwadi (well) as S1 and second is Near Hanuman Temple (Bore well) as S2.
- 2) Chinchani - New English School (Bore well) as S3 and Near Appa Mala (Bore well) as S4 .
- 3) Kharade - Kholvada Factory (Bore well) as S5 and Nanaso Patil Mala (Bore well) as S6
- 4) Kalgaon - Near Krishna Ghat, Krishna River. (River) as S7 and Near Datta Temple, Kalgaon. (well) as S8
- 5) Targaon – Shree Kshetra Vitthal Temple (River) as S9 and Sarpanch well (well) as S10.

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IV. RESULTES

The season wise concentration of nitrates and alkalinity is given below in Table No. 2 the following results are described by using this table .

Nitrates (NO₃): Desirable limit- 45 mg/lit and Permissible limit- no relaxation

- Monsoon season – from the lab analysis sample S4, S5, S8 and S10 are under the desirable level. Remaining all i.e. S1, S2, S3, S6, S7 and S9 are above desirable level. From which S7 Kalgaon Krishna river and S1 Belwadi well water are very much high concentration. This is alarming concentration for health point of view.
- Winter season – Only two water samples are above desirable level S1 and S2 both samples are from Belwadi. Maximum reading is 52.23 mg/lit at S2. All other samples are under desirable limits.
- Summer season- in observed reading it sample S2 had again maximum amount of concentration of nitrates as 95.76 mg/lit. as well as S1, S5, S8, and S9 are above desirable level.

Table No. 2. Concentration of Nitrates (NO₃) as per Monsoon, winter and summer season with respect to each sample notifications

Samples	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Monsoon	62.39	52.02	51.2	30.1	26.1	40.2	76.1	40	52.1	38.3
Winter	51.29	52.23	19.37	28.42	18.19	36.9	15.86	20.35	38.04	19.62
Summer	67.12	95.76	40	38	50.1	1.48	17.53	66.36	65.62	28.7

The following figure No. 1 in which graphical representation shows seasonal variation in Nitrates (NO₃) with respect to sample location points. From which we easily understand the location points S1, S2, S3, S4, S7, S8, S9 with more concentration of nitrates than 45 mg/lit. i.e. desirable and permissible level as per BIS 10500: 2012 .

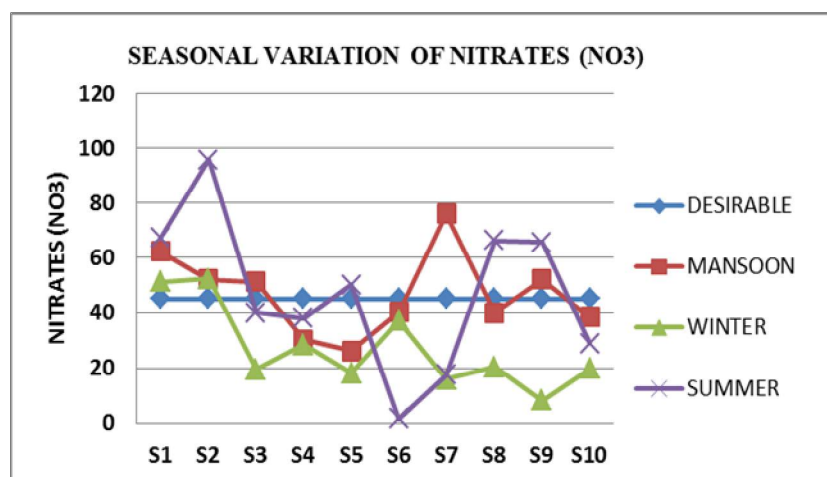


Figure No. 1. Showing seasonal variation of Nitrates (NO₃) VS sample location points.

Alkalinity (as CaCo₃): Desirable limits- 200 mg/ lit and Permissible limits- 600 mg/lit

The table no. 3 in which results for concentration level of alkalinity as per season is mention. And following description is made from it.

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- Monsoon season – maximum readings are were found out at S5 as 380 mg/lit. All samples are above desirable level from which S4, S7 were found to be 200 mg/lit.
- Winter season – maximum concentration as 372 mg/lit at sample point S10 bore well at Targaon. Followed by S5 with 354 mg/ lit concentration in water. All samples are above desirable limits.S7 Krishna river sample at Kalgaon found to be below limits.
- Summer season – All samples are above desirable limits from which maximum was 400 mg/lit at S5 Kholvada Factory, Kharade. Followed by S3 and S10 ground water sample.

Alkalinity is nothing but measure of ability of water to neutralized acid. So it is related to pH. It's related to the Total Hardness as it is come from same minerals. There are no health standards.

Table No. 3. Concentration of Alkalinity as per Monsoon, winter and summer season with respect to each sample notifications

Samples	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Seasons										
Monsoon	220	230	280	200	380	240	200	372	410	380
Winter	230	248	318	230	354	256	196	314	380	372
Summer	254	200	350	250	400	250	240	300	306	350

The figure no. 2 shows description about the seasonal variation of concentration level of Alkalinity in water samples with their notations. From which it is observed that all samples i.e. S1,S2,S3,S4,S5,S6,S7,S8,S9,S10 are above desirable level 200mg/lit. in all seasons. But all samples are below permissible level i.e. 600 mg/lit. the concentration is vary from 196 mg/lit to 410 mg/ lit.

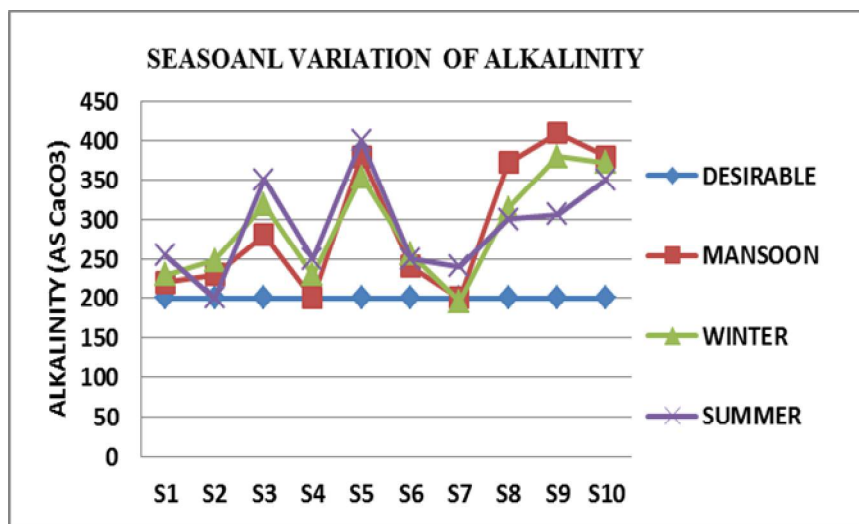


Figure No. 2. Showing Seasonal variation of Alkalinity VS sample location points.

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Table No. 4 Comparison of water samples with Drinking Water Standards for rainy, winter and summer season

Parameter (BIS:10500-2012)	Below desirable limit			Above desirable limit		
	Monsoon	Winter	Summer	Monsoon	Winter	Summer
Nitrates(NO3) 45-100 mg/lit	S4,S5,S6,S8, S10	S3,S4,S5,S6, S7,S8	S3,S4,S6,S7, S10	S1,S2,S3,S7, S9	S1,S2	S1,S2,S5,S8, S9
Alkalinity 200-600 mg/lit	Nil	S7	Nil	S1,S2,S3,S4, S5,S6,S7,S8, S9,S10	S1,S2,S3,S4, S5,S6,S8,S9, S10	S1,S2,S3,S4, S5,S6,S7,S8, S9,S10

From above table no. 4 it is observed that some location points in study area with more concentration of both Nitrates and alkalinity S1, S2 in Belwadi village for all seasons. Concentrations of alkalinity in water bodies are above desirable level in all samples that clearly indicate the water from study area in all villages are hard water. The reason behind concentration increases in nitrates in monsoon and summer season is mostly an agricultural activity, in which uncontrolled use of agrochemicals for crop like sugarcane. The surface runoff, percolation etc. are an activity that contaminates water bodies with increasing concentration of nitrates. And in case of alkalinity the geological formation i.e. minerals present in that area increases its solubility in water bodies. Hence the water is hard in all season as concentration is above desirable level 200 mg/ lit In all season.

V. CONCLUSION

Water body quality in Northeast region of Karad has been analysed in the present work. The influence of uncontrolled use of agrochemicals and other domestic activities together have been adversely affected the water bodies in study area. From above study we conclude that samples taken from study area were not exceeds permissible level for tested parameter. Following Table No. 4 shows the samples with crosses desirable limits in study area. From the observations there are problems in parameters like Nitrates (NO3) and Alkalinity. Belwadi, Kalgaon and Kharade are with more concentration of nitrates in water bodies almost in all seasons. This water is not suitable for drinking purpose. The water is hard in study area as it crosses desirable limit in all seasons. This water is utilizes for drinking and domestic purpose only after purification or by using water softeners.

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