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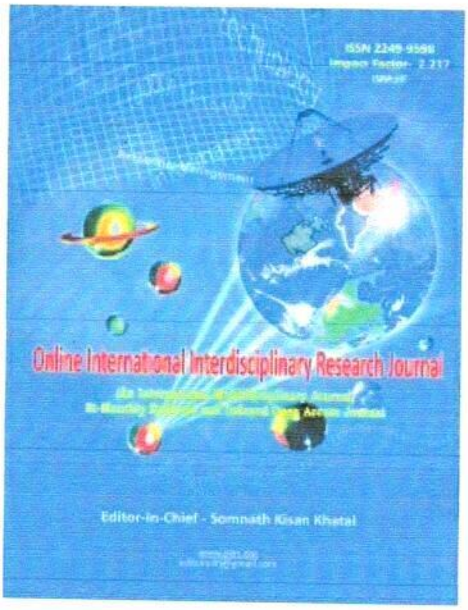

Vol V / Mar 2015 Special Issue / ISSN 2249-9598

Total Research Papers: 39

Table of contents

Search

Search Search

Other Links

Publication Ethics

Advisory Board

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Feedback

Journal Indexing

Choose Issue

Volume-11 / Issue- 01 / Jan

Go

News

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Read more

Tube Well Water Profile in Kadegaon Tehsil of Sangli District, (M.S.) (India)

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Abstract

The present research work deals with a physicochemical investigation of tube well water quality in kadegaon tehsil which involved analysis of tube well water samples used for drinking and domestic purpose collected from fifty eight tube wells located in study area. The laboratory test of the collected tube well water samples were performed for analysis of various parameters such as turbidity, total alkalinity, total solids, temperature, suspended solids, pH, odour, total Hardness (TH), electrical conductivity, total dissolved solids(TDS),dissolved oxygen (DO), colour, COD, and BOD, chloride, phosphates, calcium, fluorides, iron, magnesium, nitrates, nitrites, potassium, silicates, sodium, and sulphates. The methods employed for the analysis as per standard methods recommended by APHA, WHO. The obtained values are compared with the standard limits. The results of this study reveal that the physico-chemical parameters are within the maximum permissible limit of WHO with some slight variations in some parameters except total dissolved solids which are above the permissible limit. Hence, tube well water is safe at border line and to make it suitable for domestic, irrigation and drinking purposes the amount of TDS must be brought within permissible limit by using modern techniques for its purification. Direct consumption of untreated tube well water is potentially hazardous, and risk increases as drainage discharge increases which also cause changes in the physiological and structural aspects of the peoples who use such water for drinking purpose.

KEYWORDS: Turbidity, Total Dissolved Solids (TDS), Fluorides, Total Alkalinity, Tube well.

INTRODUCTION: A tube well is a type of water well in which a long 100-200 mm (4 to 8 inches) wide stainless steel tube or pipe is bored into an underground aquifer. The lower end is fitted with a strainer and a pump at the top lifts water for irrigation on the depth of water table. A small reservoir of water is made at the outlet of the tube well. This reservoir is used for different usage of water by the local population.

Tube well water is our most valuable natural resource from the ground. It is essential to all basic human needs, including food, drinking water, sanitation, health, energy and shelter. Its proper management is the most pressing challenge to all of us. Without water, we have no society no economy, no culture, and no life although water is a global issue. The problems and solutions are often highly localized. Our natural environment supplies clean drinking water. Biodiversity supplements the ability of the environment to do this. The convention on biological diversity promotes the restoration and maintenance of biologically diverse ecosystems as a way of improving access to clean drinking water and as a means to eradicate poverty by using the services that healthy water sheds and fresh tube well water ecosystems provide naturally. Human needs and environmental needs are often uneven against each other in a false dichotomy protecting the interests of one side often harms the interests of the other. But in the case of drinking water human and environmental interests are clearly aligned. Holistic water management is essential if the world is to achieve sustainable development. The provision of potable Water to the rural and urban population is necessary to prevent health hazards. Tube well water is ultimate and most suitable fresh water resource for human consumption in both urban as well as rural areas. There are several states in India where more than 90% population is dependent on tube well water for drinking, domestic, irrigation and other purposes[12]. Tube well water is also frequently used as the alternative source for agricultural and industrial sector. However there are various ways as tube well water is contaminated such as by excess use of fertilizer in farming[2], sewage from effluent bearing water bodies[1]. Most of the industries discharge their effluent without proper treatment into nearby open pits or pass them through unlined channels, resulting in the contamination of ground Water[6]. The incidence of tube well water pollution is highest in urban areas where large volumes of waste are concentrated and discharged into relatively small areas[14]. The hydro-geochemical conditions are also responsible for causing significant variations in tube well water quality[8]. The paper makes an attempt to carry out qualitative analysis of some major physico-chemical parameters of tube well water in the study area.

STUDY AREA;

Kadegaon is a tehsil place and is located in rural and hilly area of Sangli district in Maharashtra. It is rapidly growing city on account of trade, industrial and agricultural practices located at 17018' N. latitude and 740 21' E longitudes consisting of 58 villages. The majority of population lives in rural area and most of the peoples in these villages are economically dependent on agricultural practices. The majority of the farmer cultivates various crops according to the economical point of view by using excess various chemical fertilizers and organo pesticides in their field which affects agricultural profile and also ground water profile, which is very harmful to the proper vegetation of the crops under cultivation and quality of tube well water used for drinking and domestic purpose. Most of the peoples are illiterate with potable water science. Peoples from in and around kadegaon tehsil are no exception to this. The map of kadegaon tehsil is presented by Fig.1.

MATERIALS AND METHODS:

SAMPLE COLLECTION: The sampling locations consist of urban as well rural area. The twelve tube well representative samples used for drinking purpose from different villages of kadegaon tehsil were collected in the afternoon hours between 12.00 to 2.30 pm, in polythene bottle in the month of January 2015. Each of which was representative of five sub samples collected from neighboring four village corners of the site and one from the approximate centre of the group. Polythene containers of two liter capacity which were pre-treated with dilute nitric acid, dried and rinsed three times with the sample water which was used for collecting tube well water samples. The temperature of water sample was recorded on the spot by using $1/10^{th}$ mercury thermometer. The samples were taken to the laboratory and preserved in the refrigerator. To identify and locate the samples easily, all samples carried self-adhesive labels. These were affixed on the sample bottles instead of the cover to prevent loss or misplacing causing sample mix-up. The information on the sample label includes location, date, time and temperature. The physico-chemical analysis was done as per the standard methods[3, 21]. Samples were collected in plastic container to avoid unpredictable changes in characteristic as per standard procedure[3].

Result and Discussion: The sample coding for fifty eight villages in kadegaon tehsil of Sangli district are given in Table.1. Data of physico-chemical characteristics of the tube well water samples collected from twelve representative villages among the fifty eight villages are as shown in Table. 2.

Physical Properties: The physic-chemical investigation of public water supply schemes from Krishna river in palus tehsil of sangli district is done which was found to be within the standard values prescribed by WHO [21].

1. BOD: Biological oxygen demand is an important parameter to assess the pollution of water where the contamination occurs due to disposal of domestic and industrial effluents. The low and high values for BOD were 5.1 mg/L and 7.9 mg/L in Samples C and J respectively.

2. COD: Chemical oxygen demand estimates the carbonaceous fraction of organic matter. Values for COD were 45.20 mg/L and 82.20mg/L respectively for the sample G and K.

3. Color: When pollutants like sewage, drainage, industrial waste mixed with the ground water the tube well water reveals the color of pollutants which is the indicative of degree of the pollution caused by human material, drainage, plant weeds, metallic substances and protozoa's. The samples in the study during investigation were found predominantly colorless.

4. Dissolved Oxygen: Dissolved oxygen is susceptible to environmental changes ranged from 2.9 mg/L for the sample C and highest 5.8 mg/L to the sample L.

5. Electrical Conductivity: There are several factors that determine the degree to which tube well water will carry an electrical current. This includes the concentration, mobility of ions, oxidation state and temperature of the tube well water. It was observed that samples I had 518 and the samples E had 650 umho/cms which were below the permissible limit.

6. Total hardness: The presence of multivalent metal ions (calcium and magnesium) which comes from the minerals dissolved in the water is known to cause hardness in water bodies. Hardness of water is dependent upon the ability of these ions to react with soap to form a precipitate or soap scum. The reaction of iron and manganese in fresh water may contribute to the hardness of such water. The highest total hardness for the sample F was 34.59 mg/L and the lowest for the sample I was 21.69 mg/L in the overall sampling places.

7. Odour: There was essentially no particular odour of specific nature was recorded

8. pH: It indicates the acidity or alkalinity of a substance from 1.0 to 14. Acidity increases as the pH gets lower. Aquatic organism differs as the range of pH in which they live. pH of most of the samples was mild alkaline to a high recording of 7.8 for the sample G and lowest 6.9 for the samples J with corresponding high alkalinity of 166.62 and 114.63 mg/L respectively. Low pH value may be due to incoming Water[12]. Hence, the alkaline pH of the most of the samples is explained by the fact that inadequate rain in the region, bringing in no enough water for dilution of alkaline substances resulting in keeping the pH on its higher level possible. However, in tube well water p^H usually ranges from 6.5 to 8.5 and it is bio-tolerable. The pH of most of the samples of the study carried is within the permissible range recommended[21] by WHO (2003).

9. Suspended Solids: Suspended minerals are a measure of the amount of sediment moving in water. Solids present within water bodies are highly dependent on the flow of water which usually increases during and immediately after rain events. As the sediment settles out of the water it gradually becomes clear, but in most cases, the aquatic habitats are often destroyed. It was observed that sample E of tube well water are known to have this suspended solid inside them with the highest value of 96.8 mg/L while sample G having the lowest value of 93.5 mg/L. All the values were observed to be at border line but within the permissible limit.

10. Temperature: Temperature is one of the important environmental parameter in fresh water eco-system which affects the ability of water to hold oxygen, the rate of photosynthesis by aquatic plants and the metabolic rate of aquatic organisms. Cause of temperature includes

Weather removal of shading stream, bank vegetation, impoundment, discharge of water into to the stream. The variation of trend in temperature noted in the present study, and it was found to be minimum for sample A (25.9oC) and maximum for sample B (28.4oC) which commensurate with the desired limit.[19]

11. Total Dissolved Solids: Total dissolved solids is an important parameter to ascertain the vulnerability of salt content in dissolved state. Total dissolved solids ranges from 370.05 to 470.78 mg/L. which shows most of the samples are at the border line of the permissible limit.

12.Total Alkalinity: Alkalinity of natural water is generally due to presence of bicarbonates formed in reactions in the soil through which the water percolates and sometimes may also be due to carbonates and hydroxides. It is a measure of the capacity of the water to neutralize acids and it reflects so- called buffer capacity. Correspondingly, the highest alkalinity was 166.62 mg/L observed for the sample G However, the lowest alkalinity noted was 114.63 mg/L for the sample J.

13. Turbity: Turbidity is described as the measure of amount of particulate matter suspended in Water. When tube well water appears to be cloudy or opaque in nature is said to be highly turbid which can cause increased water temperature because suspended particles absorb more heat and also reduce the amount of light penetrating the Water. The samples K had lowest turbidity value of 14.7 NTU and a highest of 21.6 NTU for the sample F. The values of the suspended solids ranged from 93.5 mg/L to 96.8 mg/L for the sample G and E respectively. The dissolved solids varied from 370.05 mg/L for the sample H and 470.78 mg/L for the sample L. The water found turbid or muddy in color is due to varieties of materials which are being discharged by domestic and industrial use[11] Suspended matter, in general reduces the diversity of life in aquatic systems. Total solids were recorded 609.88 mg/L as maximum in sample H and minimum 504.95 mg/L in sample D. The observations are in agreement with similar one made by Shastri[16] and Gupta[4] et.al.

14. Chemical Nutrients: Presence of nutrients and oxygen in tube well water is essential for the sustained proliferation of organisms. However, nutrient enrichment leads to undesirable change in the structure and function of ecosystems[17]. Nutrients stimulate growth of aquatic plants which in turn decay and consume oxygen and emanate hydrogen sulphide. This accumulation exerts high biological demand on the ecosystem. In addition with accumulation of nutrients the organic biomass increases leading to pollution[7]. The quantity of nutrients present in the water samples varies. Calcium forms the most abundant cation in fresh tube well water. It contributes hardness to water. It has been a basic parameter for detecting pollution of tube well water by sewage plant before development of bacteriological produces cathartic effect in human beings[18].

Calcium ranged from a low value of 19.0 mg/L in sample I to a high value of 27.9 mg/L in sample F. Chloride ranged from 60.4 mg/L to 64.4 mg/L in sample A and sample K respectively. The level of fluoride did not unduly vary and the lowest was recorded as 0.34 mg/L in sample C and the highest in sample K with a value of 0.94 mg/L. Iron was high in sample H with a value of 2.8 mg/L, while low with 1.4 mg/L in sample F. Magnesium had high value in sample F with 2.9 mg/L and 1.6 mg/L as low value in sample I. The values of nitrates varied only slightly and were high in sample J with a value of 8.2 mg/L and low in sample A as 6.8 mg/L. Phosphate was high in sample D with a value of 2.3 mg/L, while it was 1.5 mg/L in sample L as lowest. Potassium was 2.4mg/L and 1.4 mg;/L as high and low in sample C and sample A. Silicate varied from 14.3 mg/L in sample L and 18.5 mg/L in sample D . Sodium was high in sample J with a value of 2.1 mg/L, and low in sample F with a value of 1.0 mg/L. Sulphate ranged from 6.1 mg/L to 8.1 mg/L in sample H and A respectively. Most of the fresh water derives their sodium, potassium, calcium, chloride, sulphate and other nutrients from soils and rocks. Phosphate is considered amongst the primary limiting nutrients in ponds and lakes[15]. Phosphate was generally low with a peak in summer season. The higher concentration of it could be from the run-off from the agricultural fields[9]. The main source of the formation of nitrate is the decomposition and biodegradation of organic matters. High nitrates would indicate high pollution load. Intrusion of sewage into the natural tube well water increases levels of nitrate. Nitrate level in the sample is below permissible limits making them suitable for humans and live stock consumption[11].

Conclusion: Among the twelve sampling places of villages in kadegaon tehsil, all the samples for most of the parameters were found to have their values within the standard values prescribed by WHO and NAFDAC except total dissolved solids are found at extreme border line which needs to be reduced by using modern technique.

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References:

1. Adekunle, A. S. Effects of Industrial Effluent on Quality of Well Water Within Asa Dam Industrial Estate, Ilorin, Nigeria. Nature and Science 2009:7(1).

2.Altman, S. J, Parizek, R. R. Dilution of nonpoint source nitrate in ground water. J. Environ. Quality1995: 24:707-717

3. APHA., Standard methods for the examination of Water and waste Water. *American public Health Association, Washington.DC.* **(2005)**

4.Gupata S. K.. and Tiwari M.S., Assessment of heavy metals in surface Water of lower lake, Bhopal, India. *Poll Res.*, 24(**4**): **805-808** .(**2005**)

5. Jameson J. and Rean J.J., **1996**. Pollution status of the river complex Sabarmati at Khead region of Gujarat. 1. Physico-chemical Characters. *Poll Res.*, 15(1) : **53-55. (1996)**

6. Jinwal, A, Dixit, S. Pre and post monsoon variation in physio-chemical characteristic in groundwater quality in Bhopal, India. Asian j. Exp. Sci. 2008: 22 (3).

7.Laws E.A.. In Aquatic Pollution. *Wiley Inter science Publication*, John Wiley and Sons, New Yourk, pp. **351-369.(1981)**

8. Mahanta, B.N, Sarkar, B.C, Singh. G, Saikia, K, Paul, P. R. Multivariate statistical modeling and indexing of ground water quality in and around Jharia coalfields, Jharkhand. NSEEME. 2004

9..Majoo S., Impact of habitation on hydrobiology of lake Pichola, Udaipur. *IJEP*, 11(**11**), **853-856. (1991)**

10.Pore S.V.Physico-Chemical investigation of public water supply schemes from Krishna River in palus Tehsil of Sangli District.Asian Journal of Multidisciplinary studies, Vol(2) 10 pp 181-185. Oct.2014.

11. Ragunathan M.G., Mahalingam S. and Vanithadevi K.., a study on physic-chemical characteristics of Otterilake and Palar river Water s in Vellore town (Tamilnadu). *India. J. Aqua. Biol*, 15 (**1-2**): **56-58**. **(2000)**

12.Ramachandraiah, C. Right to drinking water in India, Centre for Economic and Social Studies. 2004:56.

13. Renault D and Wallender W., "Nutritional Water Productivity and diets", *Agricultural Water Management,* Vol.**45**, pp. **275-296**. **(2000)**

14.Rao, Sudhkar M, Mamatha, P. Water quality in sustainable water management, Current science. 2004:87

15. Schindler D. W., Light, temperature and oxygen regimes of select 3d lakes in the experimental lakes area, north-western Ontario. *J. Fish. Res. BdCannda*, **28: 157-169**. (**1971)**

16. Shastri Y and Pandey D.C., Hydro biological study of DahiKhura reservoirs. *J. Environ. Biol*., 22(**1**): **67-70**. **(2001)**

17. Smitha V.H., Tilman G. D. and Nekola J.C., Eutrophication: Impact of excess nutrient inputs on fresh Water, marine and terrestrial ecosystems. *Env.Poll*. **100: 179-96**. **(1999)**

Asian Journal of Multidisciplinary Studies, 2(10) October, 2014 185

18.Srinivas C.H., Piska R. S. and Reddy R. R., Ground water pollution due to the industrial effluent in Kothur industrial area, Mahaboobnagar, Andhra Pradesh.India *Exo.Env.and Cons*., **8(4) : 377-380. (2002)**

19. Thirumathal K,.Sivkumar A A. , Chandrakanta J and suseela K P., Physico-chemical studies of Amaravathi reservoir ,Coimbatore district, tamilnadu. *J Ecobiol*,.**14(1):13-17**. **(2002)**

20. Trivedy, R.K. and Goel. P.K. Chemical and Biological Methods for Water Pollution Studies. Environmental Publications, Karad, India. (**1984)**

21. WHO**.** Guidelines for Drinking Water Quality 2nd Ed. Addendum. Microbiological Agents in Drinking Water. World Health Organization, Geneva. **(2003)**

Figure. 1. Map of Kadegaon Tehsil of Sangli District in Maharashtra(India)

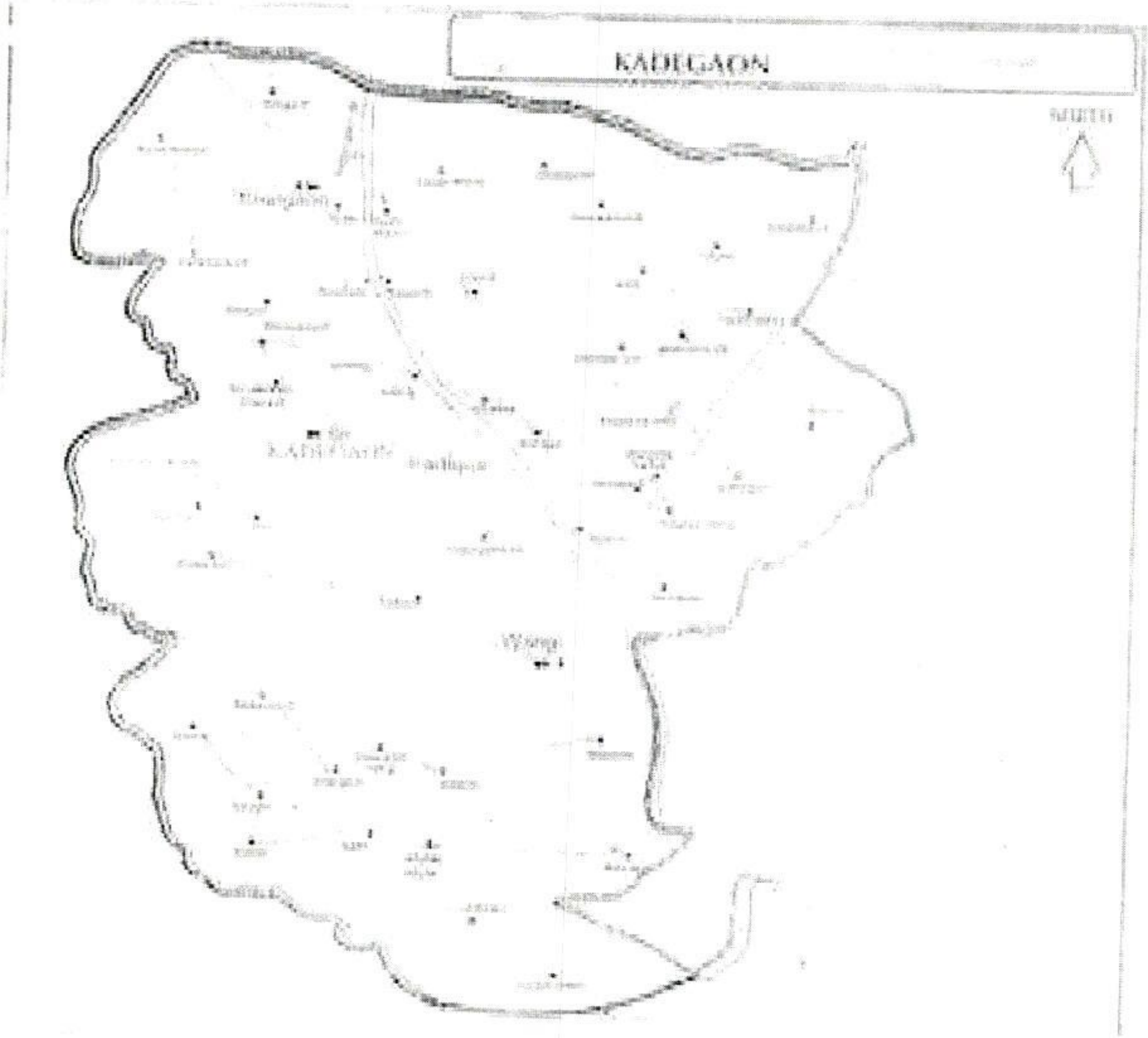
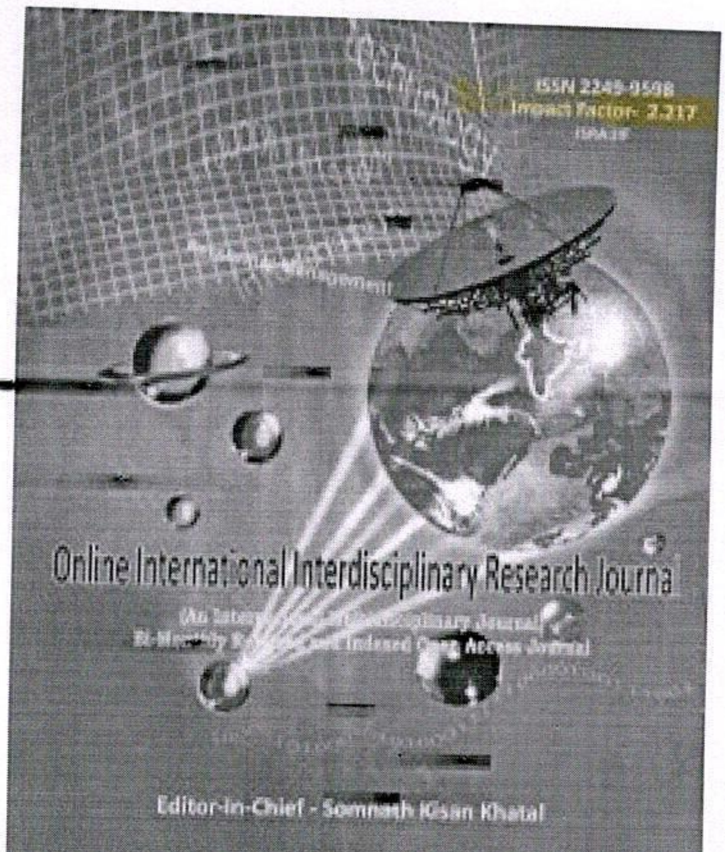


TABLE: 1 the sample coding for cluster of five neighboring villages under study area in Kadegaon tehsil of Sangli district.

Sr.	Sampling Place Cluster of Villages	Sample Code	Sr.	Sampling Place Cluster of Villages	Sample Code	Sr.	Sampling Place Cluster of Villages	Sample Code
1 2 3 4 5	Raygaon Bombalewadi Hingangaon (BK.) Shalgaon Yede	**A**	21 22 23 24 25	Kotij Kherade (vita) Tupewadi(Kh) Bhikawadi(kh) Hanmant vadiye	**E**	41 42 43 44 45	Shirgaon Shirasgaon Sonsal Sonkire padali	**I**
6 7 8 9 10	Karandewadi Belawade Vihapur Renushewadi Nimsod	**B**	26 27 28 29 30	Shivaji nagar Kadegaon Kadepur Chikhali Amarapur	**F**	46 47 48 49 50	Vajegaon Chinchani Ambak Asad Vadgaon (Mohite)	**J**
11 12 13 14 15	Upale (wangi) Upale(mayani) Saspase Tondoli Soholi	**C**	31 32 33 34 35	Nevari Ambegaon Yevlewadi Shivani Vadiye raibaag	**G**	51 52 53 54	Ramapur Deorashtre(E) Deorashtre(W Kumbhargaon	**K**
16 17 18 19 20	Dhanewadi Kherade(wangi Kanherwadi Yetgaon Tupewadi(y)	**D**	36 37 38 39 40	Hingangaon(kh Shelakbao Tadsar Wangi-East Wangi-West	**H**	55 56 57 58	Apshinge Khambale(A) Kotaweade Nerli	**L**

TABLE: 2. Physico-Chemical parameters and the Nutrients of the Samples A to L

Sr	Parameters	The Sample Codes of the villages at the bank of Krishna River in Kadegaon Tahasil											
A	(mg/L)	A	B	C	D	E	F	G	H	I	J	K	L
1	BOD	**5.6**	5.3	5.1	5.2	5.7	7.6	7.1	6.8	6.6	**7.9**	6.3	6.7
2	COD	80.40	70.40	56.80	51.30	81.4	76.20	**45.20**	67.40	66.79	65.60	**82.20**	64.66
3	Color	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear	clear
4	DO	4.1	3.1	**2.9**	4.4	3.4	5.0	5.6	5.9	5.4	4.3	3.0	**5.8**
5	Dissolved solids	431.40	380.	435.	370.40	388.12	468.98	461.12	**370.05**	459.74	440.61	448.95	**470.78**
6	Ele. Con. umho/cms	559	539	577	520	**650**	537	543	630	**518**	644	524	647
7	Total Hardness	22.20	23.11	22.69	23.82	22.57	**34.59**	26.82	28.24	**21.69**	27.88	25.26	26.16
8	Odour	No	No	No	No	No	No	No	No	No	No	No	No
9	p^H	7.3	7.2	7.4	7.6	7.1	7.5	**7.8**	7.3	7.7	**6.9**	7.2	7.3
10	Suspended solids	96.3	95.0	95.6	96.0	**96.8**	94.5	**93.5**	94.0	95.4	96.6	93.6	96.1
11	Temp o^0C	**25.9**	**28.4**	28.1	27.2	26.1	26.3	26.7	27.1	26.8	26.2	26.4	26.5
12	Total Solids	540.05	509.56	576.85	**504.95**	544.92	527.45	538.24	**609.88**	602.54	543.52	510.08	510.83
13	Total Alkalinity	166.53	161.62	159.19	163.20	118.65	154.95	**166.62**	159.95	157.75	**114.63**	119.30	165.72
14	Turbidity(NTU)	19.2	17.7	20.7	18.6	20.2	**21.6**	18.2	16.9	15.6	15.3	**14.7**	20.7
B	**Nutrients (mg/L)**												
15	Calcium	19.5	20.4	27.0	23.4	22.1	**27.9**	25.3	26.0	**19.0**	24.1	26.8	20.9
16	Chlorides	**60.4**	61.7	63.7	60.9	62.3	63.8	61.1	62.6	62.6	62.3	**64.4**	63.2
17	Fluorides	0.54	0.64	**0.34**	0.84	0.44	0.84	0.64	0.64	0.54	**0.94**	0.74	0.84
18	Iron	1.7	2.0	2.7	2.2	2.4	**1.4**	1.6	**2.8**	2.7	1.5	2.4	1.8
19	Magnesium	2.5	2.7	2.0	**2.2**	2.5	**2.9**	2.6	2.1	**1.6**	2.4	1.8	2.8
20	Nitrate	**6.8**	7.9	7.0	8.1	7.4	7.3	7.5	7.4	7.7	**8.2**	7.8	7.6
21	Nitrite	0.4	0.2	**0.1**	0.3	**0.5**	0.2	0.3	0.2	0.4	0.3	0.2	0.2
22	Phosphates	2.0	1.9	2.1	**2.3**	1.6	2.2	2.1	1.8	1.6	2.2	2.0	**1.5**
23	Potassium	**1.4**	2.3	**2.4**	1.7	2.3	1.6	2.1	1.5	2.3	1.7	**1.4**	1.8
24	Silicates	14.4	17.4	16.3	**18.5**	15.2	18.2	16.9	15.0	14.9	18.4	16.7	**14.3**
25	Sodium	1.8	2.0	1.5	1.3	1.1	**1.0**	1.9	1.3	1.7	**2.1**	1.6	**1.2**
26	Sulphates	**8.1**	7.7	8.0	7.2	7.6	7.1	7.2	**6.6**	7.9	7.8	7.0	7.3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