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Assessment of Physico-chemical Properties of Drinking Quality of Various Water Resources in Kodoli Village.

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Abstract - *Drinking water quality is the most important to the human life. In this research paper assessment of various parameters of water from various resources in kodoli village is carried out. Samples are collected from various water resources in the pre monsoon & post monsoon season . Collected samples are tasted and results are find out. The test results of various water quality parameters are compared with Indian Standard Coad for water quality(IS-10500). After result discussion & analysis further low cost water treatment method is suggested for upgradation of water quality .*

Key Words: **Drinking Water tests, Physico-chemical properties, IS-10500.2012, Pre monsoon, Post monsoon, Sample Stations, Result comparison, Remedial measures.**

1.INTRODUCTION

Water plays vital role in human life. It is necessary for industry, agriculture and human existence and many other purposes. The healthy water ecosystem is depends upon the physico-chemical and biological characteristics. Due to presence of various human activities , urbanization and industrialization, the groundwater sources are degraded gradually; therefore pure, safe, healthy and odorless drinking water is amatter of deep concern. There are various pollutants in groundwater due to seepages viz. organic and inorganic pollutants, heavy metals, pesticides, fluorides etc. Due to these pollutants problem of pollution of water arises.

1.1 Why Quality of Water is Necessary?

Water accounts for about 70% of the weight of a human body and about 80% of the earth's surface is covered by total water. Out of the total quantity of water present on the all over earth, about 97% of the earth's water resources are locked up in the oceans and seas, this water too saline to drink and for the direct use for agriculture and industrial purpose and about 2.4% is trapped in giant glaciers and polar icecaps. Hence not even 1% quantity of water is available for drinking, agriculture, domestic and industrial consumption. Due to increasing industrialization on one hand and exploding population on the other, the demand of water supply has been increasing in large amount. But considerable part of this limited quantity of water is polluted by sewage, industrial wastes and wide verities of synthetic chemicals.Thus, the quantity as well as quality of clean water supply is of vital significance for the welfare of mankind. Access to safe drinking water is key to sustainable development of country and essential to food production, quality human health and poverty reduction. Safe drinking water is essential to living life anda satisfactory safe supply must be made available to consumers. Water is therefore becoming a crucial factor for development and the quality of life in many countries. Good drinking water is not a luxury but one of the most essential requirements of human life itself. The WHO revealed that 75% of all diseases in developing countries arise from polluted drinking water. Thus, water quality concerns are often the most important component for measuring access to improved water sources. Safe Drinking water is the most important for living life.

1.2 How to Analise the Quality of Drinking Water?

Water quality should be identified by the various physico-chemical, biological parameters. Physical parameters are Colour, Odour, pH value, Turbidity, Total Dissolved Solids (TDS). General parameters concerning substances undesirable in excessive Amount are Aluminium, Calcium, Chloride, Free Residual Chlorine, Iron, Magnesium, Nitrate, Sulphate, Total alkalinity, Total Hardness , & other Bacteriological parameters like E-coli or thermotolerant coliform bacteria & Total coliform bacteria tested by referring the standard test procedures by the IS-3025 guidelines parameters can be identified. For analyzing quality test results are compared with IS-10500.2012 guidelines.

2. OBJECTIVES

- To assess the quantity and quality of drinking water from various sources in Kodoli village.
- To examine the levels of physico-chemical and microbial parameters present in drinking water.
- To compare the various result parameters with Indian Standard (IS 10500-2012) Drinking Water guideline values.

- To suggest low cost remedial measures for the identified parameters for kodoli village .

3. SCOPE

- Drinking Water quality parameters of water sample from sampling station collection, including physico-chemical and microbial parameters are taken into consideration.
- Study of various sources of water used for drinking in the Kodoli village.
- Improving quality of existing water sources & system used for drinking.

4. METHODOLOGY

4.1 Study area

Kodoli is a census town in Kolhapur district in the Indian state of Maharashtra. It is situated between the foothills of Panhala fort (Ranges) and Warana River. Kodoli is well developed town as per all point of view. Kodoli is located at 16.88°N 74.2°E. It has an average elevation of 548 metres (1797 feet).

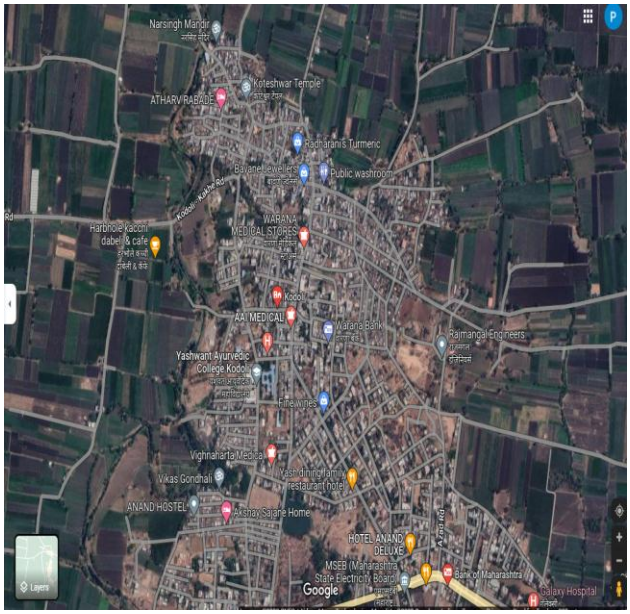

Fig.-1.1 Map of Kodoli (Section 1) , Tal-Panhala, Dist– Kolhapur.

Fig.-1.2 Map of Kodoli (Section 2) , Tal-Panhala, Dist– Kolhapur.

4.2 Field Work

It included the important data collected through oral interview with people in Grampanchayat and different sections of the village.

4.3 Zoning of the Study Area, Interview and Site Observation Assessment:

The Kodoli village was partitioned into two sections with the help of main road network as shown in Figure 1.1 & 1.2, as Section 1 & section 2 . These sections of the examination area had been visited for on-spot evaluation of water supply sources and also oral interview had been conducted with occupants to find out the different resources of water supply accessible to them, recurrence of supply, availability and the nature of water supply.

4.4 Sample collection

Samples are collected from various resources in section 1 & Section 2. In the present investigation, total 7 water samples are taken. two samples from three well, three from bore well and one from piped river water were collected. Selection of seven different stations were identified based on importance of the source, where most of the people were utilizing them for consuming reason. All the water samples were taken from the respective site during pre-monsoon (April 2021) as well as post-monsoon season (August 2021) for testing in cleaned plastic polyethylene bottles of 1liter between 10.00 a.m.-11:30 a.m. For bacteriological examination, samples were taken in sterilized bottles. The water sampling collection, methods as well as strategy were done as per standards set down in the IS 3025 guidelines.

Table 1.1: Details of the Sources from which Samples Collected

Sr. No	Sources	Sample Code	Location
1	Piped Water	S1	Kodoli Water Supply
2	Open Well	SO1	Ganapati Galli
3	Open Well	SO2	Koteshwar Mandir
4	Open Well	SO3	Kapare Mala
5	Bore Hole	SB1	Warananagar
6	Bore Hole	SB2	Gangadhar Colony
7	Bore Hole	SB3	Housing Society

4.5 Laboratory Analysis

After collecting water samples, they were brought into the laboratories for evaluation of physical (Colour, Odour, pH value, Turbidity, Total Dissolved Solids (TDS)), Other Chemical parameters (Aluminium, Calcium, Chloride, Free Residual Chlorine, Iron, Magnesium, Nitrate, Sulphate, Total alkalinity, Total Hardness) as well as microbiological properties (E-coli or thermotolerant coliform bacteria). Water temperature was determined during sample collection at sampling station. The water quality parameters were analyzed by using standard procedures recommended by Standard methods for the examination of water and wastewater as per IS 3025 guidelines

5 TEST RESULTS AND DISCUSSION

5.1 Quantitative Analysis

The different sources of consuming water in Kodoli village shown in Table 1.2 Different Drinking Water Resources Used in Kodoli Village

Table 1.2 Different Drinking Water Resources Used in Kodoli Village

Section	Location	Primary Source	Secondary Source	Remarks
One	Ganapati Galli	Household Piped Water	Open Well , Bore Hole	Intermittent Water Supply
	Koteshwar Mandir	Household Piped Water	Open Well, Bore Hole	Intermittent Water Supply
	Kapare Mala	Household Piped Water	Open Well	Intermittent Water Supply
		Water		Supply
	Gangadhar Colony	Household Piped Water	Bore Hole, Open Well	Intermittent Water Supply
Two	Nivrutti Colony	Household Piped Water	Bore Hole	Intermittent Water Supply
	Manugraph road	Household Piped Water	Bore Hole	Intermittent Water Supply
	Waranan agar	Household Piped Water	Bore Hole	Intermittent Water Supply

The total water availability per day for different sources is represented in Table 1.3 as below

Table 1.3 Estimating Water Availability from Open Well

Season	Resource (Open Well)	Discharge rate of water (litres/min)	Average hours of pumping in a day	Total water availability (litres/ day)
Pre Monsoon (April 2021)	SO1	400	6	144000
	SO2	300	2	36000
	SO3	600	10	360000
Total Availability				540000
Post Monsoon (August 2021)	SO1	400	8	192000
	SO2	300	4	72000
	SO3	600	10	360000
Total Availability				624000

5.2 Physico-Chemical Analysis:

The experimental results of various physico-chemical parameters for water samples are presented in Table 1.4 and Table 1.5

Table 1.4 : Physico-Chemical Analysis of Different Samples during Pre-Monsoon Season

Parameters	Sample Code						
	S1	SO1	SO2	SO3	SB1	SB2	SB3
Temperature	22	23	22	22	21	22	22
pH Value	7.1	7.7	8	7.2	6.8	7	7.5

Turbidity	30.6	60	42.5	41	15	17	23
TDS	110	215	300	427	284	412	356
Aluminium	0	0	0	0	0	0	0
Chloride	15	40	60	67	80	62	70
Iron	0	0.01	0	0	0.015	0	0
Magnesium	2	3	4	4.5	5.5	4.2	5
Nitrate	0	1.25	1.4	1.1	1.2	1.5	1.1
Sulphate	34	67	75.2	55	56	53	61
TA	22	106	81	65	75	57	45
TH	90	114	200	250	300	225	286

Table 1.5 : Physico-Chemical Analysis of Different Samples during Post-Monsoon Season

Parameters	Sample Code						
	S1	SO1	SO2	SO3	SB1	SB2	SB3
Temperature	20	19	19.5	21	20.5	20	19
pH Value	7	7.2	7.9	6.8	6.7	7.2	7
Turbidity	41.8	72	51	45	16	23	30
TDS	127	324	430	400	314	247	412
Aluminium	0	0.01	0	0	0	0	0
Chloride	12.5	46	78	78	50	80	79
Iron	0	0	0	0	0	0	0
Magnesium	1.18	3.5	4	5	3	4.2	6
Nitrate	0.05	1.25	1.1	0.9	1.3	1.5	1.0
Sulphate	32	66.6	69.8	50	56	62	60
TA	40	112	95	79	80	69	62
TH	84	126	199	268	180	220	309

5.3 Microbial Analysis:

The experimental results for microbial parameter of water samples are represented in Table 1.6 and Table 1.7

Table 1.6 Microbial Analysis of Different Samples During Pre-Monsoon Season

Parameter	Sample Code						
	S1	SO1	SO2	SO3	SB1	SB2	SB3
Total Coliform	18	12	17	9	17	12	11

Table 1.7 Microbial Analysis of Different Samples During Post-Monsoon Season

Parameter	Sample Code						
	S1	SO1	SO2	SO3	SB1	SB2	SB3
Total Coliform	19	9	16	11	15	13.5	15

5.4 Comparison between seasonal variation for physical, chemical, microbial characteristics of different water samples and Indian standards:

The range of physico-chemical and microbial parameters of different samples for the pre-monsoon and post-monsoon season are given in Table 1.8 and compared with Indian standards guidelines IS-10500 .

Sr. No.	Parameters	Unit	Results		IS-10500 (Range)
			Pre Monsoon	Post Monsoon	
1	Temperature	°C	20-23	19-21	
2	pH	-	6.8-8	6.7-7.9	6.5-8.5
3	Turbidity	NTU	15-60	16-72	1
4	TDS	mg/l	110-427	127-430	500
5	Aluminum	mg/l	0	0.01	0.03
6	Chloride	mg/l	15-80	12.5-90	250
7	Iron	mg/l	0-0.015	0	0.3
8	Magnesium	mg/l	2-5.5	1.18-6	30
9	Nitrate	mg/l	0-1.5	0.05-1.5	45
10	Sulphate	mg/l	34-76	32-70	200
11	TA	mg/l	22-106	40-112	200
12	TH	mg/l	90-300	84-309	200
13	Total Coliform	MPN / 100 ml	9-18	9-19	Shall not detectable in any 100ml sample

6. Suggestions According to Results Comparison

As per tests carried out and according to results mentioned above suggestions are given

6.1 For Piped Water –

There is no requirement of upgradation the system as there is treatment unit is installed already.

Only Turbidity parameter is concern but it can also be treated using Alum Dosage at individual houses. Result for turbidity parameter is showing turbidity present in post monsoon water samples

For less turbid water & medium turbid water 10-20mg/l alum doses can be applied to settle down the solid particles in the water & to reduce the turbidity.

Another Low cost treatment can be applied that is use of Moringa oleifera seed powder decreases in turbidity of ground water with increased dose at 50, 100 and 150 mg/l respectively.

6.2 For Other Sources (Open Well, Bore hole) –

According to the results of physico-chemical properties after comparison with IS- 10500 guidelines Hardness Is the concerning factor. Hardness should have to remove or reduced by applying water softening process.

Following are the methods that can be used for Reducing Water hardness at home –

1. Resin based water softener
2. Water Enhancer
3. Water Conditioner
4. Antiscalant systems
5. Magnetic Water Softner

7. CONCLUSION

- Primary Water Supply System in the study area is developed well. But for the turbity parameter
- Use of Moringa oleifera seed powder decreases the turbidity.
- Secondary Water Resources Open wells and Bore Wells ; drinking quality of these resources checked by test procedure as per IS 3025 guidelines .
- For Secondary Resources as per results find out Hardness of the water is not in the range of acceptable limit as per Is 10500 guidelines .
- Hardness of the water can be reduced at home be applying various water softening methods such as resin based water softening method, water enhancing method, water conditioning , antiscalant system , magnetic water softening methods.

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