



Physico-Chemical Investigation of Selected Ground water Samples in villages of Barshitakli Tahsil region, District Akola M.S.

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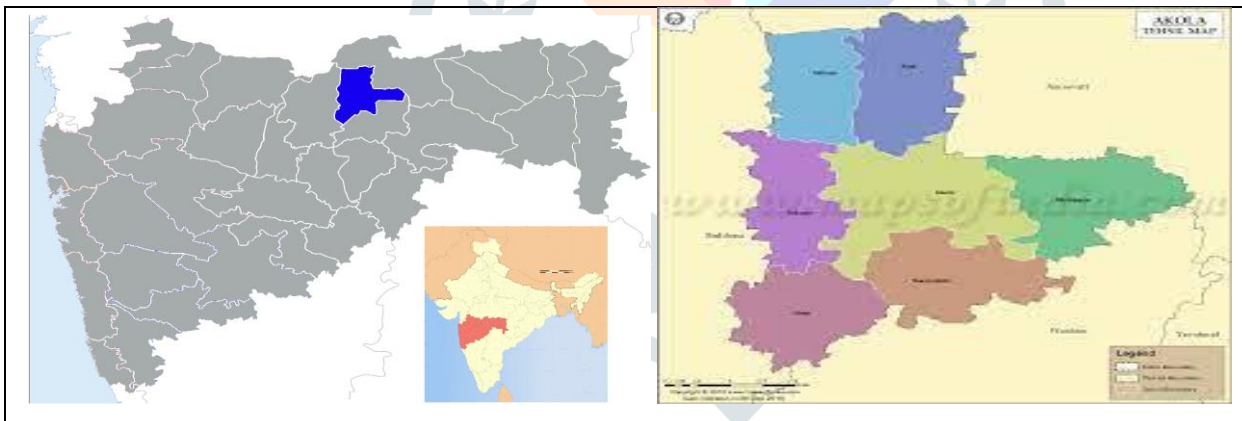
ABSTRACT: This investigation of physico-chemical parameters determines the ground water quality of some selected ten villages from Barshitakli Tahsil region of Akola district in Maharashtra. The water samples were collected from various bore wells used as drinking water. In this region it is found that farmers using more pesticides for agriculture purpose therefore ground water contamination occurs in large extent. The physico-chemical parameters such as Electrical conductivity, Turbidity, pH, Total hardness, Total Dissolved Solids (TDS), Mg^{++} ions, Ca^{++} ions and Chloride ion were investigated to determine the present condition of the ground water quality during the periods of three months from November 2022 to January 2023.

KEYWORDS: Physico-chemical parameters, Ground water, bore well, Barshitakli, etc.

INTRODUCTION : Water plays an very important role in our life. “ *No life without water* ” is a common saying depending upon the fact that water is one of the naturally occurring essential requirement of all living organisms [1]. Water is also known as life due to their more abundance on earth and almost all the life processes required water. About 71 percent area of the earth is occupied by water and nearly 97 percent of water on earth is in oceans. Water exists on the earth in three states viz., solid (ice), liquid and gaseous (water vapors). The earth has an abundance of water, but unfortunately only 0.3 percent of fresh water is useful by humans [2]. The remaining 99.7 percent is in the oceans, soils, icecaps, and floating in the atmosphere. The majority of fresh water is exist under ground as soil moisture and in aquifers[3]. Ground water is also frequently used as a alternative source for agricultural and industrial sector. Various ways as ground water is contaminated such as use of fertilizer in farming, seepage from effluent bearing water body. 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 [4]. Water is a very good solvent.

Pure water is tasteless, colorless, and odorless is therefore water is known as universal solvent. When carbon dioxide is dissolved in water it forms very weak carbonic acid as an even better solvent result. As water passes through soil and rock, it dissolves very little amounts of minerals and holds them in solution. Calcium and magnesium dissolved in water are the two most common minerals that form water "hard." The degree of hardness becomes more as the calcium and magnesium content increases. The water quality parameters decide the portability of water [5]. In the procedure of purifying most of the impurities were added to drinking water, apart from that the level of pollution is increased by human anthropological activities such as adding chemical fertilizers, use of pesticides and rainwater management, pollution, urbanization, industrialization and emissions. All pollutants are making it unsuitable by altering its physico chemical properties such as color, odor, pH, electrical conductivity, chloride content, alkalinity, hardness, Melt Oxygen, Organic Oxygen, Chemical need oxygen, as well as soluble solids [6]. In order to evaluation of water quality index, we have to carried out the physico-chemical investigation of bore wells drinking water.

STUDY AREA: Barshitakli is located in Akola district of Maharashtra at N 20° 57' 91", E 77° 06' 67". It has an average elevation of 312 meters from sea level. It is situated in *Vidharbha* region of Northern Maharashtra. It is one of seven Tahsils of Akola district. Barshitakli is famous for cotton industry. Barshitakli's water bearing formation is basalt (Deccan trap) fractured, jointed under phreatic conditions and the soil type is medium black and deep black soil [7]. There are 159 villages in Barshitakli Tahsil. The total area of Barshitakli is 812.97 sq.km with population density of 184 per sq.km.



MATERIAL AND METHODS : In the present survey, The bore well water Samples were collected with all necessary precautions in the morning between 8:30 AM to 11:30 AM in Barshitakli Tahsil regions from ten different villages (**Table-1**). Water samples were collected in polythene bottle regularly alternate month. The samples were immediately transferred to laboratory for the estimation of various physico-chemical parameters like Temperature, Transparency and pH were recorded at the time of sample collection by using Thermometer and Portable Digital pH meter. Electrical conductivities were measured by using digital conductivity meter. The TDS values were measured by using TDS meter. Transparency was measured with the help of Secchi Disc. While other Parameters Such as, Hardness, Calcium, Magnesium, Chlorides, Iron, Sulphate and Nitrate were Estimated in the laboratory by using

Standard Methods as Prescribed by APHA. Present study involves the investigation of water quality in terms of physico-chemical methods [8].

SAMPLE COLLECTION: Ground water samples were collected from ten bore wells at various locations within study area in selected villiages in Barshitakli, Dist. akola during pre and post monsoon season. Details of sampling locations are along with their co-ordinates illustrated in Table 1.

Table 1: Sampling location and their coordinates:

Sampling Location Area Code	Location	Co-ordinates
GW ₁	Alanda	20.712456143738706, 77.33332084311317
GW ₂	Barshitakli	20.68551080440507, 77.28415745445525
GW ₃	Bhendi Mahal	20.66665352430127, 77.26849081027495
GW ₄	Chincholi Rudrayani	20.832091807227958, 77.54483280013577
GW ₅	Dagadparwa	20.730045082938673, 77.40464930994077
GW ₆	Dhaba	20.661896622185274, 77.35548933777481
GW ₇	Donad Bk.	20.654725881961383, 77.30289139251323
GW ₈	Januna	20.69445287187666, 77.2545998922805
GW ₉	Kanheri Sarap	20.709671344295117, 77.23465554601295
GW ₁₀	Mahan	20.700926549271838, 77.32166948833141

PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER SAMPLES: The collected samples were analyzed for different physico-chemical parameters such as pH, Electrical conductivity, Turbidity, TDS, Total hardness, Ca⁺⁺, Mg⁺⁺, Chloride ions, and temperature as per the standard methods (APHA, 1998) and the results were compared with the Indian Standards (IS: 10500) for potable water.

RESULTS AND DISCUSSION: The Physico-chemical data of the bore wells water samples are collected. The results of the samples vary with different collecting places due to the different nature of soil contamination [9]. The water quality analysis of different ground water samples have been carried out for pH, Turbidity, Conductance, Total hardness, TDS, Ca⁺⁺, Mg⁺⁺, Chloride ions, and temperature. The status of water quality of these ground water sources are presented in table 2.

Table 2 : Showing status of water quality of these ground water sources

Area code	pH		Turbidity (cm)		Conductance (µmhos/cm)		Total Hardness (mg/l)		TDS (mg/l)		Ca ⁺⁺ (mg/l)		Mg ⁺⁺ (mg/l)		Chloride ions (mg/l)		Temp °C	
	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po	Pr	Po
GW1	7.3	8.0	11.2	16.5	120	180	170	210	468	450	80	180	72	54	120	140	26	22
GW2	6.7	7.2	5.6	6.5	170	210	180	215	450	509	72	250	74	62	160	164	27	24
GW3	6.9	7.1	3.2	5.2	160	230	210	284	480	450	78	260	68	81	142	155	24	27
GW4	7.3	6.8	4.1	5.6	133	270	210	246	502	457	97	240	87	46	155	190	25	21
GW5	7.2	7.2	2.8	4.3	125	166	240	246	350	605	68	210	72	72	86	120	28	23
GW6	6.3	7.4	3.5	7.1	125	188	250	290	498	544	65	150	64	64	182	20	29	24
GW7	7.2	6.9	3.5	4.7	142	200	270	285	609	807	54	168	68	52	163	190	25	24
GW8	7.1	7.8	8.2	13.2	126	198	286	290	568	402	80	125	64	45	54	144	24	26
GW9	7.5	7.6	4.9	6.1	146	210	244	302	390	512	61	230	81	65	144	203	26	24
GW10	7.4	7.6	7.9	9.5	180	234	246	325	480	562	60	200	54	45	200	256	24	22
Mean	7.225		6.68		175.65		269.3		267.05		136.4		64.5		149.4		23.5	
IS: 10500	6.5- 8.5		5.0-10*		-----		300-600		500-2000*		75-200*		30-100*		250-1000*		--	

Results of the present investigations are : The pH value found permissible limit as per IS: 10500 of all samples. Turbidity of samples Alanda (GW₁) & Januna (GW₈) found 16.5 & 13.6 respectively which is the not permissible limits as per IS: 10500. Electrical conductivity varied between 120 to 180 µmhos/cm to 180 to 270 µmhos/cm in pre and post monsoon season. The same trend was observed in the case of total hardness of various ground water sources. It varied from 170 to 280 mg/l and 210 to 325 mg/l in pre and post monsoon respectively. TDS in all the samples were found to be within standard limits (IS:10500). In few samples the ions of calcium have crossed the standard limit (IS:10500) during post monsoon season. Chloride content of the ground water samples of hand pump were found to be within limit during in the range pre and post monsoon season respectively. Temperature of the various ground water samples were noted to be between 24-29 °C and 21- 26 °C during pre and post monsoon season respectively.

Overall ground water quality of Barshitakli tahsil region is found unsafe to human beings. Apart from a small number of occurrence where some parameters such as Turbidity at Alanda & Januna village, bore well water were beyond prescribed limits of drinking water (IS:10500). These two villages have high erosion of soil. High erosion of soil causes increase in the values of physio-chemical parameters in post monsoon. Sometimes advanced farming use of chemicals, pesticides and fertilizer affects the quality of drinking water.

CONCLUSIONS : It is concluded from the present investigation that water collected from ten different bore wells some samples were found unsafe for drinking and domestic use.

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