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Studies on Physicochemical Parameters to Assess the Water Quality of Ground Water Sources of Different Places in Daryapur Tahsil, Maharashtra (India)

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ABSTRACT

Groundwater is one of the most valuable natural resources, which supports human health, economic development and ecological variety. Groundwater is a valuable dynamic and replenishes able natural resource in present day and limited in extent. Groundwater resource assessment of a region involves a detailed study of the sub-surface water, including geology and hydrogeology, monitoring and production of well data. The water quality guidelines provide a Limit Value for each parameter for drinking water. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as color, taste, odor, TDS, pH, Hardness, Alkalinity, Chlorides, fluoride, Sulphate, Iron, turbidity and Nitrate used for testing of water quality. In present study, Drinking Water Quality, were analysis by various standards and analytical methods and TDS is found in 24 water sample out of 36.

Keywords: *Drinking Water, Water Quality Parameters, Ground Water*

INTRODUCTION

Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70% surface of earth is covered by water, Majority of water available on the earth is saline in the nature only 3 % of exists as fresh water. Fresh water has become a scare commodity due to over exploitation and pollution [1-2]. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants. Therefore it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water revels much about the metabolism of the ecosystem and explain the general hydro - biological relationship [3].

Drinking water quality standards describes the quality parameters set for drinking water (Wiki). Ground water is the major sources of drinking water. 65% of human body made by water, Out of the total water consumed by human beings, more than 50 % of it is consumed for industrial activity and only a small proportion is used for drinking purposes [4]. Industrial development

(Either new or existing industry expansion) results in the generation of industrial effluents, and if untreated results in water, sediment and soil pollution [5-6].There are several diseases have been identified among the human beings, which are caused by using contaminated water. Water born disease infections occur during washing, bathing and consumption of contaminated water during food preparations. Therefore it is necessary that the quality of water should be checked at regular time of interval because the financial losses due to water born diseases have negative impact on the nation. Nowadays this is the major problem of developing countries throughout the world. The main aim of the present study was to give an idea about the pollution level of ground water in terms of physico-chemical characteristics. There is no information is available in relation to physicochemical characteristics of ground water at Daryapur. Few researchers [7-8-9-10] in different regions of India have been studied the physico-chemical parameters of the various water bodies. Good Quality of Drinking water is very necessary for improving the life of people and to prevent from diseases [11].

Having mainly excessive amounts of heavy metals such as Pb, Cr and Fe, as well as heavy metals from industrial processes are of special concern because they produce water or chronic poisoning in aquatic animals [12]. High levels of pollutants mainly organic matter in river water cause an increase in biological oxygen demand [13], chemical oxygen demand, total dissolved solids, total suspended solids and fecal coli form. They make water unsuitable for drinking, irrigation or any other use [14]. There are trends in developing countries to use sewage effluent as fertilizer has gained much importance as it is considered a source of organic matter and plant nutrients and serves as good fertilizer [15]. Improper waste disposal and over exploitation of resources has affected the quality, not only of tap water, but also of ground water [16]. The recent research in Haryana (India) concluded that it is the high rate of exploration then its recharging, inappropriate dumping of solid and liquid wastes, lack of strict enforcement of law and loose governance are the cause of deterioration of ground water quality [17].

The quality of ground water depends on various chemical constituents and their concentration, which are mostly derived from the geological data of the particular region. Ground water occurs in weathered portion, along the joints and fractures of the rocks [18]. The adverse effects on ground water quality are the results of man's activity at ground surface, unintentionally by agriculture, domestic and industrial effluents [19]. The quality of water may be described according to their physicochemical and micro-biological characteristics. Therefore, the quality of ground water varies from place to place, with the depth of water table, and from season to season and is primarily governed by the extent and composition of dissolved solids present in it. However it is very difficult and laborious task for regular monitoring of all the parameters even if adequate manpower and laboratory facilities are available [19-20-21]. Therefore, in recent years an alternative approach based on statistical correlation, has been used to develop mathematical relationship for comparison of physicochemical parameters. The present study deals with study of physico-chemical parameters of ground water in Daryapur City India.

MATERIAL AND METHODS

Study Area

The present study was carried out in Drayapur Taluk, Daryapur is a Taluka in Amravati District of Maharashtra State, India. Daryapur Taluka Head Quarters is Daryapur town. It belongs to Vidarbha region. It belongs to Amravati Division. It is located 52 KM towards west from District head quarters Amravati. 601 KM from State capital Mumbai towards west It is too Hot in summer. Daryapur summer highest day temperature is in between 34 °C to 46 °C. Average temperatures of January is 24 °C, February is 27 °C, March is 31 °C, April is 35 °C, May is 39 °C.(figure no 1)

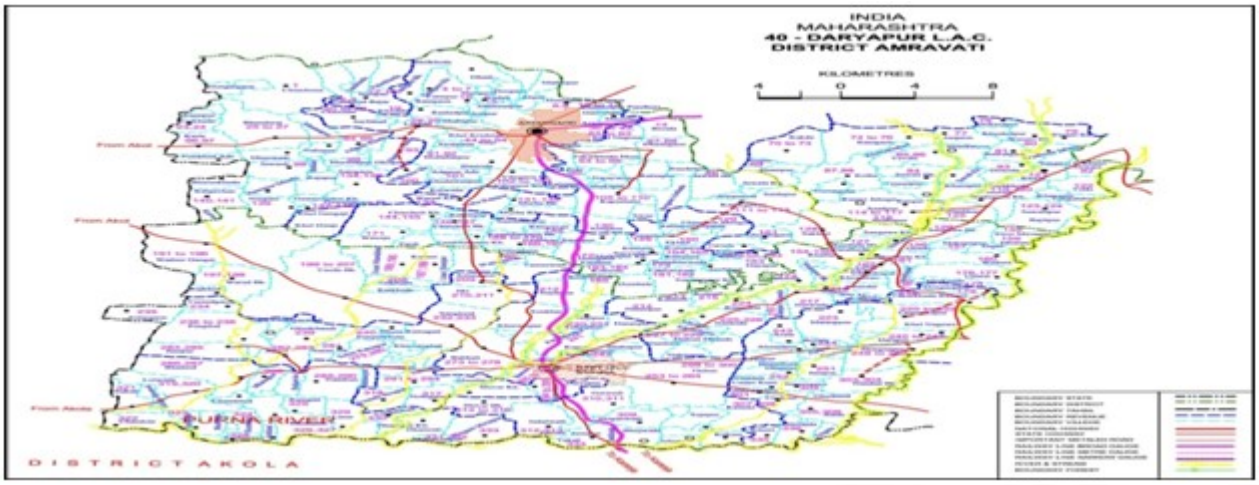

Figure 1: Study Area

The Water Samples from ground water sources were collected from different villages in the morning hours between 10 to 12 am in plastic bottle. The Water samples were immediately brought in to Laboratory for the opinion of various Physico -chemical parameters Such as, TDS, pH , Hardness, Alkalinity, Chlorides, fluoride, Sulphate, Iron , turbidity and Nitrate were estimated in the Laboratory by using Indian Standard Procedures (Titration method, Uv-Visible Spectrophotometer) [22-23].

Physico-Chemical Properties of Ground Water, Daryapur Tahshil

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physico-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity. Following different physic chemical parameters are required to for monitoring quality of water.

Odor, color and Test- Color should be transparent in sample. No organic or suspend particle should present. Sample should be odorless. After color and odor test of sample should be acceptable.

Ph- pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance and total alkalinity [17]. The reduced rate of photosynthetic action the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month. Various factors bring about changes The pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition [24] pH value of water indicates the hydrogen ion concentration in water. The pH scale is extends from 0 (very acidic) to 14. As per IS: 10500-2012 Desirable limit for pH is 6.5-8.5.

Alkalinity- It is primarily made of carbonate (CO32-) and bicarbonate (HCO3-), alkalinity acts as a stabilizer for pH. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple dil HCl titration in presence of phenolphthalein and methyl orange indicators. Acceptable limit of alkalinity is 200 mg/l and in the absence of alternate water source, alkalinity up to 600 mg/l is acceptable for drinking.

Total Hardness (TH) - In groundwater hardness is mostly contributed by bicarbonates, carbonates, sulphates and chlorides of calcium and magnesium. So, the principal hardness causing ions are calcium and magnesium. It is measured by titration method by standardised EDTA sol. using Erichrome black T as indicator. [25] Have classified water as soft, moderate, hard and very hard. As per IS: 10500-2012 Desirable limit for TH is 200 and 600 mg/l in Permissible limit.

Sulphate - Natural water contains sulphate ions and most of these ions are also soluble in water. Many sulphate ions are produce by oxidation process of their ores, they also present in industrial wastes. The way to measure quantity of sulphate is by UV Spectrophotometer. As per IS: 10500-2012 Desirable limit for Sulphate is 200 and 400 mg/l in Permissible limit

Chloride -It is measured by titrating a identified volume of sample with standardized silver nitrate solution using potassium chromate solution in water or eosin/fluorescein solution in alcohol as indicator. The latter indicator is an adsorption indicator while the former makes a red colored compound with silver as soon as the chlorides are precipitated from solution. As per IS: 10500-2012 Desirable limit for fluoride is 250 and 1000 mg/l in Permissible limit.

Turbidity - Turbidity is a measure of the degree to which the water loses its transparency due to the being there of suspended particulates. It is essential to eliminate the turbidity of water in order to effectively disinfect it for drinking purposes. As per IS: 10500-2012 Desirable limit for fluoride is 1 and 5 NTU in Permissible limit.

Fluoride - Fluoride occur as fluorspar (fluorite), rock phosphate, triphite, phosphorite crystals etc, in nature. Among factors which control the concentration of fluoride are the climate of the area and the presence of accessory minerals in the rock minerals assemblage through which the ground water is circulating. As per IS: 10500-2012 Desirable limit for fluoride is 1 and 1.5 mg/l in Permissible limit.

Nitrate - Nitrate is present in rare water and mainly it is a form of N2 compound (of its oxidizing state). Nitrate is produced from chemical and fertilizer factories, matters of animals, decline vegetables, domestic and industrial discharge. The method to measure quantity of nitrate is by UV Spectrophotometer. As per IS: 10500-2012 Desirable limit for nitrate is max.45 and no relaxation in permissible limit.

TDS - Water is a good solvent and picks up impurities easily. Pure water is tasteless, colorless, and odorless and is often called the universal solvent. Dissolved solids" refer to any minerals, salts, metals, cations or anions dissolved in water. Total dissolved solids (TDS) include inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water. As per IS: 10500-2012 Desirable limit for TDS is 500 and 2000 mg/l in Permissible limit.

Iron- Iron is brought in to the solution and reduced into ferrous state by boiling with HCl and hydroxylamine hydrochloride. It is then treated with 1-10 phenanthroline at pH 3.2 to 3.3 to form orange red chelate. The color solution obeys beers law. Alter the wavelength to 510 nm by pressing the nm arrow up or down. As per IS: 10500-2012 Desirable limit for Iron is 0.3 ppm.

RESULTS AND DISCUSSION

The quality of water resources depends on the management of the water sources. This would include anthropogenic discharge as well as the natural physicochemical properties of the area.

The Water Samples from ground water sources were collected from different villages in the morning hours between 10 to 12 am in plastic bottle. Total 36 water sample collected from different villages and different ground water sources such as dug well, hand pump bore well from public sources in Daryapur tahshil. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico - chemical parameters Such as, TDS, pH , Hardness, Alkalinity, Chlorides, fluoride, Sulphate, Iron , turbidity and Nitrate were estimated in the Laboratory by using Indian Standard Procedures (Titration method, Uv-Visible Spectrophotometer) [22-23]. Out of these water sample all parameter near about is on limit except total dissolved solid (TDS), Most of daryapur tahshil containing soil is salinity affected that's why hear present many solid such as mineral springs, carbonate deposits, salt deposits. Out of these 36 water sample 24 sample having TDS is more than 2000 that is **(2078, 4035, 3062, 6042, 4074,7 002, 2066, 2037, 3001, 4007, 5002, 2079, 2053, 2064, 2048, 5027, 5002, 2077, 8098, 6009, 4072, 7074, 5005, 15051**) and taste of these water sample was salty. Maximum TDS was found in Bhamod village from bower well that is 15051.

The observed values of physico-chemical parameters of experimental ground water samples are presented in Tables no. 1.

Name of Habitation	Type of Source	Tast	Odour	Colour	Fe mg/L	Nitrate mg/L	Fl mg/L	CL	TDS mg/L	AK	SULPHATE	pH	Turbidity	TH
Yeoda	H.P.	**Salty**	Odourless	Colourless	0.2	19.45	0.567	195	**2078**	169	54.87	8.2	0.84	264
Yeoda	D.W.	**Salty**	Odourless	Colourless	0.16	19.88	0.853	295	**4035**	120	42.36	8.2	0.58	314
Yeoda	D.W.	**Salty**	Odourless	Colourless	0.27	19.66	0.849	108	**3062**	228	62.36	8.3	0.88	264
Yeoda	D.W.	**Salty**	Odourless	Colourless	0.25	20.27	0.87	247	**6042**	124	49.34	8.3	0.92	242
Yeoda	D.W.	**Salty**	Odourless	Colourless	0.15	19.32	0.306	242	**4074**	188	74.25	8.4	0.34	208
Yeoda	D.W.	Tastless	Odourless	Colourless	0.28	7.187	0.529	234	1246	164	53.21	8.2	0.88	274
VARUD (KU)	D.W.	**Salty**	Odourless	Colourless	0.38	20.29	0.84	222	**7002**	124	70.36	8.2	0.55	329
Arala	D.W.	Tastless	Odourless	Colourless	0.19	3.29	0.975	198	950	157	47.48	8.5	0.87	322
Amla	H.P.	Tastless	Odourless	Colourless	0.23	5.1	0.819	169	1796	264	38.24	8.2	0.97	208
Amla	H.P.	Tastless	Odourless	Colourless	0.44	6.13	0.75	242	1950	192	34.25	8.2	0.83	212
Amla	H.P.	**Salty**	Odourless	Colourless	0.22	18.16	0.38	279	**2066**	298	32.21	8.3	0.97	362
Amla	H.P.	**Salty**	Odourless	Colourless	0.24	28.34	0.34	216	**2037**	186	21.75	8.3	0.76	256
Dongargaon	B.W.	**Salty**	Odourless	Colourless	0.38	29.13	0.89	236	**3001**	175	28.33	8.4	0.69	245
Markanda	D.W.	Tastless	Odourless	Colourless	0.22	16.96	0.81	177	1912	118	22.64	7.2	0.48	174
Nanded	D.W.	**Salty**	Odourless	Colourless	0.38	21.33	0.63	249	**4007**	138	42.33	8.2	0.55	173
Nanded	D.W.	**Salty**	Odourless	Colourless	0.41	14.23	0.78	302	**5002**	150	23.17	8.2	0.38	241
Nanded	H.P.	**Salty**	Odourless	Colourless	0.29	12.08	0.63	198	**2079**	132	46.33	8.3	0.25	262
Nanded	H.P.	**Salty**	Odourless	Colourless	0.22	28.46	0.52	128	**2053**	167	12.64	8.4	0.91	179
Nanded	H.P.	**Salty**	Odourless	Colourless	0.38	16.23	0.47	158	**2064**	124	18.19	8.2	0.56	232
Shinganpur	H.P.	Tastless	Odourless	Colourless	0.37	18.36	0.48	137	1336	184	29.38	7.9	0.69	178
Gaiwadi	D.W.	Tastless	Odourless	Colourless	0.32	19.34	0.62	120	1724	156	43.65	7.3	0.98	190
Khairi	H.P.	**Salty**	Odourless	Colourless	0.41	31.22	0.73	158	**2048**	172	88.14	7.1	0.74	188
Khairi	H.P.	**Salty**	Odourless	Colourless	0.29	18.32	0.698	160	**5027**	234	79	7.2	0.59	173
Wander Ga.	Tap	Tastless	Odourless	Colourless	0.38	16.32	0.346	125	734	193	36.98	8.5	0.46	199
Wander Ga.	D.W.	Salty	Odourless	Colourless	0.23	19.32	0.235	340	**5002**	138	54.98	7.4	0.5	196
Wander Ga.	D.W.	Tastless	Odourless	Colourless	0.38	21.33	0.145	326	1253	196	79.5	8.2	0.74	164

Wander Ga.	D.W.	**Salty**	Odourless	Colourless	0.42	23.12	0.214	230	**2077**	178	47.36	7.2	0.98	186
Sanglud	Tap	Tastless	Odourless	Colourless	0.35	18.34	0.365	237	608	135	48.76	8.3	0.83	182
Sanglud	D.W.	**Salty**	Odourless	Colourless	0.37	21.34	0.248	251	**8098**	141	74.36	7	0.73	144
Sanglud	D.W.	**Salty**	Odourless	Colourless	0.23	23.45	0.654	249	**6009**	190	98.14	7.9	0.87	262
Pimplod	B.W.	**Salty**	Odourless	Colourless	0.31	28.36	0.486	242	**4072**	136	89.47	8.2	0.84	188
Pimplod	D.W.	**Salty**	Odourless	Colourless	0.37	18.34	0.348	213	**7044**	127	80.36	8.1	1.2	154
Jainpur	D.W.	Tastless	Odourless	Colourless	0.22	18.23	0.259	278	756	168	20.69	8.2	0.36	212
Mahuli	H.P.	**Salty**	Odourless	Colourless	0.29	12.34	0.586	198	**5005**	164	28.64	8	1.25	178
Bhamod	B.W.	**Salty**	Odourless	Colourless	0.21	22.79	0.937	124	**15051**	146	78.45	7.4	0.15	178
Ramtirth	H.P.	Tastless	Odourless	Colourless	0.42	7.947	0.887	137	404	154	42.36	8.1	0.33	230

Table no. 1

(TDS: Total Dissolved Solids TH: Total Hardness; AK: Akalinity, Cl: Chloride, Fl: Fluoride)

TDS is positively correlated to K concentrations of groundwater indicating the influence of agricultural activities and wastewater leakage, where it is known that potassium ion originates from agricultural fertilizer and wastewater [26]. On the other hand, the relationship between NO_3 and TDS show similar trend which suggested the leaching of nitrate fertilizers applied in the agricultural areas. NO_3concentration may be further affected by complex hydro chemical processes such as nitrification or denitrification [27-28-29-30]. In the given sample fluoride is found in limited quantity but TDS is more than 2000 in most of sample (Table no.1)

CONCLUSION

In this study, Water quality is dependent on the type of the pollutant added and the nature of mineral found at particular zone of bore well. Monitoring of the water quality of ground water is done by collecting representative water samples and analysis of physicochemical characteristics of water samples at different locations of Daryapur tahshil. In present study was observed Out of 36 water sample 24 sample having TDS is more than 2000. And Daryapur contain salinity affected area hence hear concluded that salinity containing soil having more TDS and these ground water affected sample is not fit for drinking purposes , unfit water are not only devastating to people, but also to animals, fish, and birds also destroy aquatic life. Safe drinking water is vital to sustain life and a satisfactory (adequate, safe and accessible) supply must be available to all.

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