

# Evaluation of ground water quality with special reference to sulphate concentration of rural area near Karad City, (Satara) Maharashtra

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(Received 2 April, 2020; Accepted 29 August, 2020)

## ABSTRACT

This study involves the analysis of the groundwater quality, and the evaluation of its physicochemical characteristics. Groundwater is directly related to human existence and to the sustainable development of a society, because it plays an important role as a water resource. More than two billion people worldwide depend on groundwater for their daily water supply, and a large proportion of the world's agricultural and industrial water requirements are supplied by groundwater. Groundwater is not just any water below the ground surface but water found in rocks that are permeable enough to permit reasonable quantity of water to yield into wells. Due to an increasing demand for groundwater in response to rapidly growing urban, industrial, and agricultural water requirements, several countries, especially those in arid and semi-arid zones, are experiencing water shortages now a days. The ground water samples from nine sampling stations around Karad tahsil area were tasted for the physicochemical analysis and results were compared to the World Health Organization Standard (WHO) to determine its suitability for domestic, agricultural and industrial purposes.

*Key words : Groundwater quality, Physico-chemical characteristics, Karad Tahsil, etc.*

## Introduction

Water is life. It is one of the fundamental needs on the globe. The total amount of water on the earth is about 1.35 billion cubic kilometers. About 97.1% has been locked into oceans as saltwater. Ice sheets and glaciers have arrested 2.1%. Only 0.2% is the fresh water present on the earth, which can be used by human for variety of uses. Remaining amount of water is in underground form (Pandey and Carney, 1998). But unfortunately it has been getting polluted day by day due to different anthropogenic activities.

Hence, it is a need, to conserve the available water and prevent it from every type of pollution (Manjare and *et al.*, 2010). Water is essential for variety of purposes to human beings as well as to plants and animals. It has many uses which include drinking and other domestic uses, irrigation, fishing, power generation, transportation, industrial applications and many more. Water is the only natural resource to touch all aspects of human civilization from agricultural and industrial development to cultural and religious values embedded in society (Reddi Jhansilakshmi and E.U.B., 2014). Water quality term

is generally used to express the physical, chemical and biological state of water. This is directly related to the suitability of water for a particular use (Trivedi and Goel, 1984). Ground water is the primary source of water supply for all the requirements in our state now days (Chaturvedi Samiksha *et al.*, 2003). It is the single largest and most readily available source of irrigation and more than 60% of the total area under irrigation depends on ground water sources. Near about 65-70% of rural water supplies are based on ground water. Hence, ground water plays a very important role in the economy of our state. Therefore, needs to be monitored in terms of quality and quantity for sustainable development and management.

Normally water is never pure in a chemical sense. It always contains impurities of various kinds dissolved as well as suspended (Parikh and Mankodi, 2012). These include dissolved gases like  $\text{CO}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$  and  $\text{N}_2$ , dissolved minerals like Calcium, Magnesium and Nitrate salts, suspended materials, clay, silt and sand along with microbes (Matini *et al.*, 2012). The natural impurities in water are in very low concentration, which are derived from atmosphere and soil. These impurities do not pollute water and the same is potable. Contamination of water is certainly one of the key issues, as it can prevent water from being used for its intended purpose (Williams, 1989). Contamination can enter the water bodies through, a) Transfer of pollutants from municipal, industrial liquid waste disposal, wash off and soil erosion from agricultural lands carrying fertilizes, herbicides and pesticides. An attempt is made to check the sulphate concentration of ground water samples from nearby Karad city.

### Study Area

The Karad Taluka extends between  $17^\circ 18'$  north to  $17^\circ 38'$  north latitude and  $73^\circ 52'$  east to  $74^\circ 16'$  east longitude. Karad is situated on the bank of Krishna river and famous for confluence of Krishna and Koyana rivers. Karad taluka lies in the western limits of Deccan plateau and the southern Maharashtra particularly in Satara district. For this study water samples were collected from nine villages near by Karad city.

### Materials and Methods

The water samples were collected from November 2017 to June 2018 (second week of every month).

The samples were of grab or catch samples and collected in sterilized bottles using the standard procedure in accordance with the standard method of American Public Health Association (1995) (APHA 1995). Spectrophotometer Digital Systronic Range 340 to 960  $\mu\text{m}$  was used for analysis and chemicals used were of analytical grade.

### Results and Discussion

The effects of water pollution are not only devastating to people but also to animals, fish and birds. Polluted water is unsuitable for drinking, recreation, agriculture and industrial purposes. It diminishes the aesthetic quality of lakes and rivers (Chaturvedi *et al.*, 2006), More seriously, contaminated water destroys aquatic life and reduces its reproductive ability. Eventually, it is a hazard to health. Nobody can escape the effects of water pollution.

In this study pH is in the range from 6.8 to 8.1 which shows slight alkalinity at sampling station No.1. Dissolved oxygen is important for living organism to maintain their biological processes (Varale, 2009). Dissolved oxygen is found in the range of 4.2 to 6.7 mg/L for the given sampling stations. The higher concentrations of DO in winter were probably due to the fact hot conditions during winter are more favorable for higher photosynthesis. Dissolved Oxygen in water is necessary for aerobic biological activities (Patil *et al.*, 2010). BOD is a



Physico-chemical parameters of ground water of rural area near Karad city

	Sampling Station No.1	Sampling Station No.2	Sampling Station No.3	Sampling Station No.4	Sampling Station No.5	Sampling Station No.6	Sampling Station No.7	Sampling Station No.8	Sampling Station No.9
pH	8.1	7.1	7.3	7.2	6.8	6.9	7.01	7.2	7.04
DO	4.5	4.2	5.1	5.7	4.9	6.3	6.2	6.4	6.7
BOD	5.1	7.3	6.5	3.3	3.6	3.2	3.8	4.1	3.9
COD	18	21	16.1	17	14	19	16	18	19
Chloride	58.34	63.31	63.04	83.30	50.31	55.32	50.67	61.86	79.39
Sulphate	26.7	25.8	22.7	23.6	19.7	21.03	22.4	21.9	22.6
Calcium	19.6	21.1	33.4	29.6	26.7	21.8	19.8	21.3	21.7
Magnesium	16.3	17.6	26.1	26.7	25.2	19.1	21.1	19.8	17.6
Hardness	261	269	253	278	281	269	278	268	273



measure of the amount of oxygen required for the Biological Oxidation of the organic matter under aerobic conditions at 20 °C and for a period of 5 Days. Basically BOD is directly related to the extent of pollution of waste water, sewage and industrial effluents (Jadhav *et al.*, 2019). Here observed values are in the range of 3.2 to 7.3 mg/L. COD is a measure of any kind of oxidisable impurities present in the sewage. COD is a measure of both the biologically oxidisable and biologically inert organic matter present in the sewage sample (Varale, 2012; Norul, 2012). Here observed values are between 14.0 to 21.0 mg/L. The amounts of chloride found in the sample did not exceed the maximum permissible limit, i.e. 500 mg/L for drinking water prescribed by WHO. The presence of sulphate has less effect on the taste of water compared to the presence of chloride. The desirable limit of sulphate in drinking water prescribed by ICMR is 200-400 mg/L (Jadhav *et al.*, 2017; Garg, 2003). For rest of the parameters like calcium magnesium and hardness, the observed values are within the limit of WHO (WHO, 2008).

## Conclusion

Ground water use has grown spirally with population growth and agro industrial development during last some years. Maximum of the rural water supply schemes are facing the problems of corrosion and corrosion like problems now days, and this is because of the salts which are present in the water body. Hence, Ground water is suitable for the domestic and irrigation purpose as far as sulphate concentration is concerned.

## Acknowledgement

The authors are highly thankful to the university authorities and the staff for the valuable suggestions and guidance during this work.

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