

**SEASONAL VARIATIONS IN GROUNDWATER QUALITY OF VALSAD
DISTRICT OF SOUTH GUJARAT (INDIA)**

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ABSTRACT

Groundwater is an important precious natural resource. For optimum utilization of water resources, it is necessary to know both the quality as well as quantity of water. The present investigation is focused on seasonal variation in groundwater quality of Valsad district of south Gujarat (India). Groundwater samples from fifteen sampling stations were collected for two year i.e. from Aug 2007 to July 2009 and analyzed for pH, Colour, Total Hardness (TH), Calcium (Ca), Magnesium (Mg), Total Alkalinity (TA), Chloride and Sodium. Marginally higher level was observed in almost all parameters in summer season. No significant change observed in pH, Colour and Calcium.

Keys Words: Ground Water, Seasonal Variations, Valsad District, Gujarat.

1. INTRODUCTION

Groundwater is a crucial source of fresh water through out the world. It is an important natural resource that has to be conserved and preserved for sustenance of life in future [1].

Groundwater was considered to be very clean and safe in past but nowadays it is getting polluted with rapid growth of urban and industrial activities, particularly in the developing countries, where proper waste disposal measures are not followed.

Determination of physico-chemical characteristics of water is essential for assessing the suitability of water for various purposes like drinking, domestic, industrial and agriculture. The groundwater quality may also vary with seasonal changes [2].

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Water quality assessment generally involves analysis of physicochemical, biological and microbiological parameters and reflects on abiotic and biotic status of the ecosystem. This, in turn, helps in planning exploitation, antipollution or conservation strategies. Further, due to their open nature and constant change of matter and energy goes on between ecosystem and its surroundings thus making water quality a dynamic entity. The present paper assesses the groundwater quality in some villages of Valsad district and studies the effect of seasonal variations on the groundwater quality.

2. MATERIALS AND METHODS

Valsad district is laid between $20^{\circ} 8'$ to $21^{\circ} 9'$ N latitudes, and $62^{\circ} 39'$ to $73^{\circ} 30'$ E longitudes. The district has 74.10 km long sea belt. Average rainfall in this region is 1500 to 2200 mm. The district has four main rivers named Auranga, Par, Damanganga and kolak. Total fifteen sampling stations are selected for study of groundwater of Valsad district. Details of sampling station is given in Table 1.

Table 1: Sampling stations, locations and type of ground water sources

Sampling Station	Location	Type of groundwater source
S1	Tithal	Bore well
S2	Dhamdachi	Bore well
S3	Haria	Hand pump
S4	Pardi	Hand pump
S5	Khadki	Hand pump
S6	Vapi	Bore well
S7	Valvada	Hand pump
S8	Bhilad	Hand pump
S9	Sarigam	Well
S10	Nanapondha	Bore well
S11	Kaprada	Well
S12	Sutharpada	Hand pump
S13	Dharmpur	Bore well
S14	Barumal	Hand pump
S15	Kakadkua	Hand pump

The climate of the Valsad district is neither hotter nor cooler, it is temperate. It has three distinct seasons viz., Winter – from middle of October to February, Summer - from March to middle of June and Monsoon - from middle of June to middle of October.

The groundwater samples were collected in two litre polythene bottles which were thoroughly washed twice with the water to be analyzed. The physico-chemical parameters like pH, Colour, Total hardness (TH), Calcium (Ca), Magnesium (Mg), Total Alkalinity (TA), Chloride and Sodium were estimated as per APHA [3].

3. RESULTS AND DISCUSSION

Seasonal variation among parameters of groundwater samples of Valsad district are presented in fig. 1 and 2. It should be noted that precipitation as rainfall over Valsad district has been highly variable over the past several years. This together with the local weather conditions dominated by the high temperatures, dry climate and unpredictable monsoon pattern, makes it difficult to conclusively quantify the water quality as could be otherwise found in a normal monsoon year.

Also, the results of water quality might be highly influenced by such drastic weather conditions and hence mask the effect of any other factor affecting the water quality of this region [4].

A pH value of water is an important index of acidity, alkalinity and resulting value of the acidic-basic interaction of a number of its mineral and organic components [5]. A pH level of three seasons were shown in decreasing order: winter (7.4) > summer (7.3) > monsoon (7.3). Seasonwise distribution of data indicates no significant change in pH value.

Colour level of three seasons were shown in decreasing order: summer (4 hazen) > winter (3 hazen) > monsoon (3 hazen). Seasonwise distribution of data indicates no significant change in colour value.

TH level of three seasons were shown in decreasing order: summer (377 mg/l) > winter (364 mg/l) > monsoon (363 mg/l). Seasonwise distribution of data indicates little higher values in TH in summer.

Ca level of three seasons were shown in decreasing order: summer (89 mg/l) > winter (88 mg/l) > monsoon (88 mg/l). Seasonwise distribution of data indicates no significant change in Ca in summer.

Mg level of three seasons were shown in decreasing order: summer (38 mg/l) > winter (35 mg/l) > monsoon (35 mg/l). Seasonwise distribution of data indicates little higher values in Mg in summer.

TA level of three seasons were shown in decreasing order: summer (272 mg/l) > winter (265 mg/l) > monsoon (258 mg/l). Seasonwise distribution of data indicates little higher values in TA in summer. In the main land scenario, the groundwater quality in terms of salinity and hardness is generally better during monsoon and gets deteriorated in summer or pre-monsoon [6]. Total alkalinity was high during summer and low during rainy season on account of dilution of water. A similar opinion has been expressed by Jain et al. [7,8].

Chloride level of three seasons were shown in decreasing order: summer (186 mg/l) > monsoon (183 mg/l) > winter (181 mg/l). Seasonwise distribution of data indicates little higher values in chloride in summer. The higher value during summer may be due to evaporation of water and mixing of organic waste of animal origin [7].

Sodium level of three seasons were shown in decreasing order: summer (129 mg/l) > winter (125 mg/l) > monsoon (122 mg/l). Seasonwise distribution of data indicates little higher values in summer.

SAR level of three seasons were shown in decreasing order: summer (2.62) > winter (2.51) > monsoon (2.42). Seasonwise distribution of data indicates little higher values in SAR in summer.

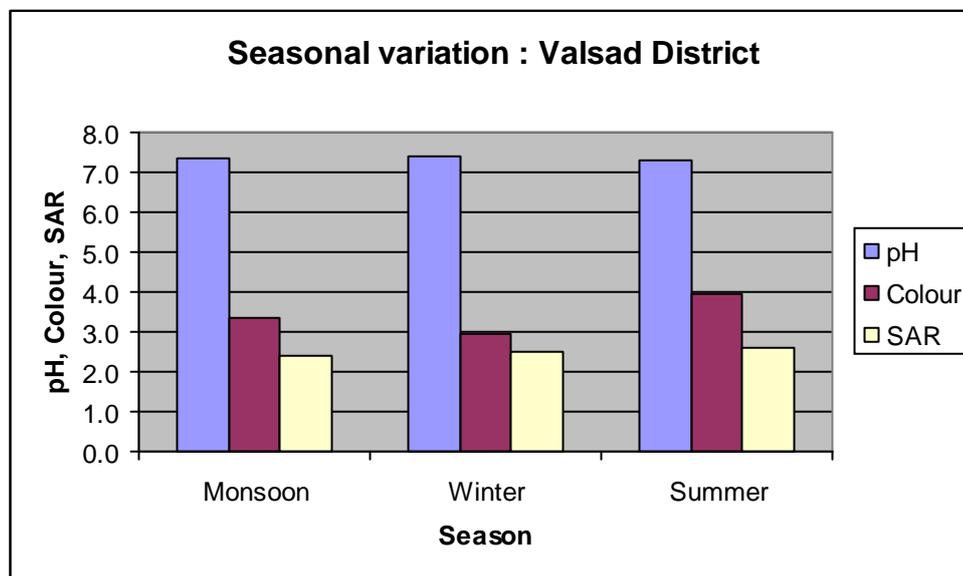


Fig. 1. Seasonal variation in Valsad district for pH, Colour, SAR

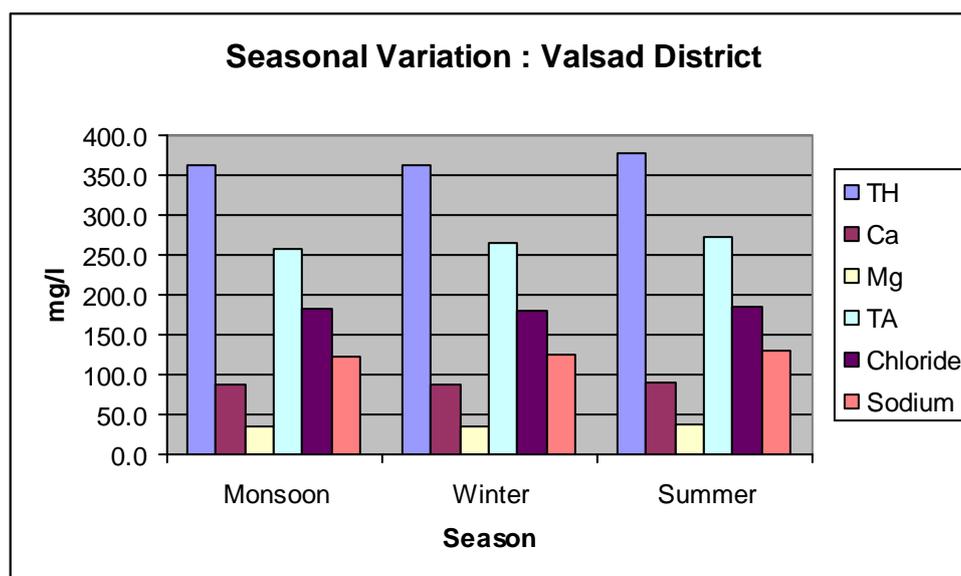


Fig. 2. Seasonal variation in Valsad district for TH, Ca,Mg,TA, Chloride, Sodium.

4. CONCLUSIONS

It can be observed that the groundwater quality in Valsad district as reflected by the physico-chemical characteristics of groundwater samples from selected sampling stations varies widely. On the basis of above discussion, it may be concluded that majority of parameters are marginally higher in summer season.

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