



Short Communication

Determination of Hydrogen ion Concentration in the Pavagada taluk of Tumkur district

**G. Manjunatha^{1*}, B. E. Basavarajappa², E. T. Puttaiah³, K. Siddappa⁴
and Sunilkumar B. Mane⁴**

1. Department of Chemistry, Sri Siddhartha Institute of Technology Tumkur-572105, Karnataka, **INDIA**
2. Department of Chemistry, Bapuji Institute of Engineering and Technology Davangere-577004, Karnataka, **INDIA**
3. Department of Environmental Science, Kuvempu University, Shankaraghatta, Shimoga-577451, Karnataka, **INDIA**
4. Department of Studies and Research in Chemistry, Gulbarga University, Gulbarga-585106, Karnataka, **INDIA**

Email: manjunathagssit@gmail.com

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ABSTRACT

To understand the quality of water, determination of total hydrogen ion concentration content present in 16 public bore wells in the Pavagada taluk of Tumkur district, Karnataka State, India have been carried out for their suitable usage during the two years 2009-11. The results clearly indicates that the minimum hydrogen ion concentration value is 6.86 at Byadanur during Post monsoon between 2009-10 and the maximum value is 7.43 at Nagalamadike during Post monsoon season between 2009-10 were observed. These values were well within the range of permissible limits (6.5 to 9.2) as per the WHO and ICMR specification and hence suitable for human consumptions.

Keywords: Borewell water, physico-chemical parameters, hydrogen ion concentration.

INTRODUCTION

Ground Water and Surface Water is an important and major source of drinking water in both urban and rural areas in India. Determination of water quality is one of the most important aspects in groundwater studies. Groundwater is highly valued because of certain properties not possessed by surface water [1]. pH is considered as an important ecological factor and provides an important piece of information in many types of geochemical equilibrium or solubility calculation. pH is an important parameter in water body since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes [2]. The permissible value of pH recommended for public water supplies is in between 6.5 to 9.2. The presence of mineral acids like sulphuric acid, iron, cadmium, aluminum (effluents) makes the water acidic i.e., pH= 0-7 and the presence of carbonates and bicarbonates of calcium, magnesium, potassium etc make the water alkaline i.e., pH=7-14. Change in pH value corresponds to the corrosion of water mains is the main problem associated with acidic waters. Higher value of pH encourages the scale formation in water heating

systems and also reduces the germicidal potential of chlorine. High pH induces the formation of trihalomethanes which are causing cancer in human beings [3].

Thus, on the light of above, the assessment of ground water quality and its suitability for drinking is the main aim of the present work which includes the determination of total hydrogen ion concentration of water samples were collected from 16 public bore wells villages in the Pavagada taluk of Tumkur district, Karnataka State, in India and comparing the results against drinking water quality standards laid down by world Health organization (W. H. O) and Indian council of medical research (I. C. M. R).

MATERIALS AND METHODS

Hydrogen-ion-concentration: pH recording were made at different stations using portable pH meter (Elico Model Li-20)

Study Area: Ground water samples were collected from 16 public bore wells villages in the Pavagada taluk of Tumkur district, Karnataka State, in India. Pavagada taluk was 170 km from the capital city of Karnataka. About 15 samples from Pavagada Taluk were selected randomly and named as PS1-PS15. Collected samples were analyzed for total hydrogen ion concentration content and compared with the permissible limits classified using Indian standards ICMR and WHO.

The samples were collected once in a month using thoroughly washed bottles (the Pyrex glass 250 mL reagent bottles with laboclen liquity soap and two times with distilled water, and then kept in BOD incubator for drying. Before collection of samples, the bottles were rinsed thoroughly with sample water for getting accurate results) for the study of various physico-chemical parameters. All collections were made between 9.00 AM to 3.00 PM throughout the period of the study.

RESULTS AND DISCUSSION

pH is measured mathematically by, the negative logarithm of hydrogen ions concentration. The pH of natural waters is greatly influenced by the concentration of carbon dioxide which is an acidic gas. pH is one of the most important operational water quality parameters. If pH is above 7, this will indicate that water is probably hard and contains calcium and magnesium. The low pH (5.3) affected the bacterial growth [4].

R. W. Gaikwad, *et al.*, has reported the water quality of the groundwater in and around Lonar Lake. Water quality has been determined by collecting groundwater samples and subjecting the samples to a comprehensive physiochemical analysis. For assessing water quality, pH, total hardness, calcium, magnesium, bicarbonate, chloride, nitrate, sulphate, total dissolved solids, iron, manganese and fluorides have been considered [5].

S. Hussaina, *et al.*, has reported the physico chemical properties like pH, conductivity, Turbidity, TDS, DO, fluoride, chloride, etc. and the values are compared for treated and untreated water samples. The samples were collected from treatment plant of Ahmedpur, Latur District, Maharashtra, India. The values changes apparently after the treatment of water [6].

Wu-Seng Lung, *et al.*, has studied, a two-layer time-variable model is developed to quantify seasonal variations of pH and alkalinity levels in acidic lakes [7, 8].

In the present work the information with reference to significant physico-chemical parameters of 16 different villages of Pavagada taluk of Tumkur District of Karnataka State, India and their pre monsoon seasonal changes were studied for a period of two years and for convenient purpose, the average values of each parameter were recorded.

Total Hydrogen Ion Concentration The seasonal variations of total hydrogen ion concentration for the two years period of 2009-11 of 16 different villages of Pavagada taluk of Tumkur District were depicted in

Figure 1 (Table 2). The relative permissible limit of different drinking water quality parameters according to WHO and ICMR are presented in Table 1.

Sl. No	Parameters	WHO	ICMR
1.	Turbidity (NTU)	10	25
2.	pH	6.5-8.5	6.5-9.2
3.	Total Hardness (mg/L)	500	600
4.	Chloride (mg/L)	200	1000
5.	Iron (mg/L)	0.1	1.0

The hydrogen ion concentration during Pre monsoon season of 2009-10 ranged between 7.06 and 7.20 at Mugudalabetta to K. T. Halli respectively. During the same season of 2010-11, it varied between 7.10 and 7.32 at Thirumani to Budi betta respectively.

The seasonal variation of hydrogen ion concentration for the summer season of 2009-10, it varied between 7.15 and 7.35 at Ponnasamudra to Nagalamadike villages respectively. While for the same season of 2010-11 pH varied between 7.17 and 7.37 at Byadanur to K. T. Halli villages respectively.

The hydrogen ion concentration during Post monsoon season of 2009-10 varied between 6.86 and 7.43 at Byadanur to Nagalamadike villages respectively. While for the same season of 2010-11, it varied between 6.93 and 7.36 at Hosakote to T. N. Betta villages respectively.

These findings showed similarities with the findings of Aboo *et al.*, [9], Reddy and Kotaiah [10]. Where as in summer, pH value was to be at lower side has been noticed by Ramaswami and Rajaguru [11], Rao and Rao [12], Ravichandran and Pundarikanthan [13], Singh *et al.*, [14], Jain *et al.*, [15] and Verma *et al.*, [16]. It is discernible from the above observation that the pH value is dependent on local conditions. The significant correlation of pH was observed with a total hardness ($r = -0.61$, $p < 0.05$), magnesium hardness ($r = 0.67$, $p < 0.05$) and potassium ($r = -0.61$, $p < 0.05$).

Table 2: Hydrogen ion concentration value of Pavagada taluk for pre, summer and post monsoon seasons during the year 2009-11.

Season and year	pH values															
	Pon na sam udra	K. T Hal li	Naga la madi ke	Thi rum ani	Jajura yanah alli	Ven kata pura	Byad anur	Raj a van thi	Deva rabet ta	T. N. Bett a	Mu gud ala bett a	Mangal vada	Belli batlu	Sasal ukunt e	Budi betta	Ho sa kot e
Pre-monsoon, 2009-10	7.06	7.20	7.06	7.06	7.13	7.13	7.06	7.07	7.067	7.20	7.06	7.07	7.13	7.13	7.07	7.06
Summer, 2009-10	7.12	7.12	7.37	7.37	7.17	7.17	7.25	7.25	7.12	7.12	7.37	7.38	7.17	7.17	7.25	7.25
Post-monsoon, 2009-10	6.93	7.21	7.43	7.43	7.13	7.13	6.86	6.87	6.93	7.22	7.43	7.43	7.13	7.13	6.87	6.86
Pre-monsoon, 2010-11	7.26	7.26	7.11	7.10	7.16	7.16	7.32	7.31	7.27	7.26	7.10	7.11	7.16	7.16	7.32	7.31
Summer, 2010-11	7.27	7.37	7.37	7.37	7.32	7.32	7.15	7.18	7.27	7.37	7.37	7.38	7.32	7.35	7.18	7.17
Post-monsoon, 2010-11	6.9	7.36	7.36	7.36	7.23	7.23	6.93	6.93	6.93	7.36	7.36	7.37	7.23	7.23	6.93	6.93

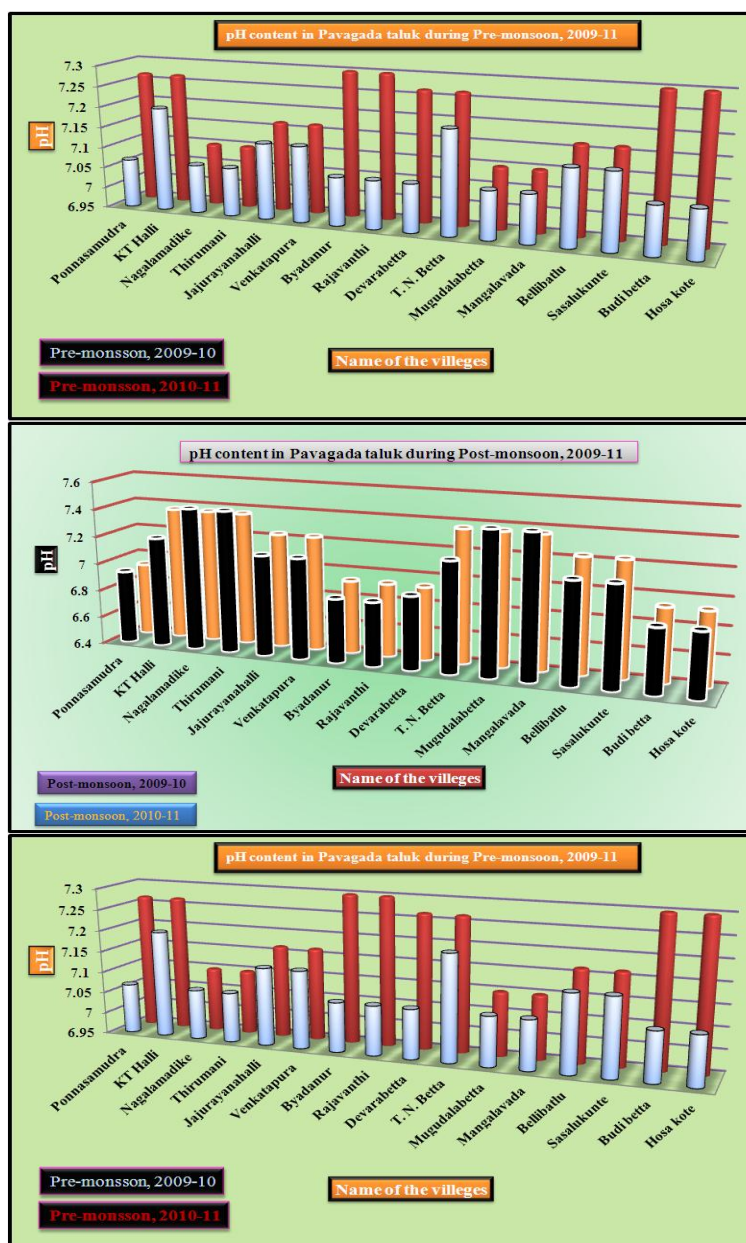


Figure 1: Hydrogen ion concentration (pH) value of Pavagada taluk for pre, summer and post monsoon seasons during the year 2009-11.

In the present study the total hydrogen ion concentration values were well within the permissible limits (6.5 to 8.5 and 6.5to 9.2) as per WHO and ICMR specification.

APPLICATIONS

This study is useful to Public to know the quality of Drinking water.

CONCLUSIONS

The present study described the determination of the total hydrogen ion concentration content in the Pavagada taluk of Tumkur district, Karnataka State, in India. The obtained results were clearly reveal that the minimum hydrogen ion concentration value is 6.86 at Byadanur during Post monsoon between 2009-10 and the maximum value is 7.43 at Nagalamadike during Post monsoon season between 2009-10 were observed. Therefore, the values were well within the range of permissible limits (6.5 to 9.2) as per the WHO and ICMR specification and hence the water from this area was suitable for drinking purpose.

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AUTHORS' ADDRESSES

1. **B. E. Basavarajappa**
Professor, Department of Chemistry,
Bapuji Institute of Engineering and Technology,
Davangere-577004, Karnataka, India.
Email: drbebdvgchem@gmail.com, Mob No: 9448105049.
2. **E. T. Puttaiah**
Professor, Department of Environmental Science,
Kuvempu University, Shankaraghatta,
Shimoga-577451, Karnataka, India.
Email: etp@kuvempu.ac.in, Mob No: 9731984886.

3. K. Siddappa

Professor, Department of Studies and Research in Chemistry,
Gulbarga University, Gulbarga-585106, Karnataka, India.
Email: siddappa_65@rediffmail.com, Mob No: 9845644075.

4. G. Manjunatha

Research Scholar, Department of Chemistry,
Sri Siddhartha Institute of Technology,
Tumkur-572105, Karnataka, India.
Email: manjunathagssit@gmail.com, Mob No: 9448951130.

5. Sunilkumar B. Mane

Research Scholar, Department of Studies and Research in Chemistry,
Gulbarga University, Gulbarga-585106, Karnataka,
Email: sunilkumar.bmane@gmail.com, Mob No: 8095027725.