

ASSESSMENT OF THE WATER QUALITY STANDARD OF GROUND WATER IN TERMS OF PHYSICO-CHEMICAL PARAMETERS IN AND AROUND OF JAMMU CITY

***¹Monika Sharma, ¹Mohit Sahwney, ¹Sakshi Kalsotra, ²Shivam Soni, ³Angad Kumar and ⁴Dr. Nirmal Kumar Bhuyan**

¹Laboratory Assistant, Indus Basin River Water Quality Laboratory, Central Water Commission, Jammu-181123

²Junior Engg., Indus Basin River Water Quality Laboratory, Central Water Commission, Jammu-181123

³Senior Research Assistant, Indus Basin River Water Quality Laboratory, Central Water Commission, Jammu-181123

⁴Assistant Research Officer, Indus Basin River Water Quality Laboratory, Central Water Commission, Jammu-181123

ARTICLE INFO

Article History:

Received 19th December, 2019

Received in revised form

29th January, 2020

Accepted 20th February, 2020

Published online 30th March, 2020

Key Words:

Jammu city, Physico-chemical parameters, pH, EC, Total Hardness, Ground water.

*Corresponding author: Monika Sharma,

ABSTRACT

The present investigation is aimed at assessing the current Ground Water Quality standard of Jammu City in terms of Physico-chemical parameters. In the selected study area the talab tillo is receiving considerable amount of man made products such as gasoline oil, road salts, and chemicals get into the ground water and witnessing an untreated waste from septic tanks and toxic chemicals from underground storage tanks and leaky landfills to contaminate the ground water. Ten ground water samples were collected from the bore wells of the study area during the period from January 2019 to December 2019 on the first working day of every month. Various parameters like pH, E.C., total hardness, total alkalinity sodium, potassium, calcium, magnesium, sulphate etc. were analysed. The present study indicates that the water quality of Ground Water in Jammu city is well within the tolerance limit taking the physico-chemical parameters in to considerations.

Copyright © 2020, Monika Sharma et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Monika Sharma, Mohit Sahwney, Sakshi Kalsotra, Shivam Soni, Angad Kumar and Dr. Nirmal Kumar Bhuyan. 2020. "Assessment of the water quality standard of ground water in terms of physico-chemical parameters in and around of Jammu city", *International Journal of Development Research*, 10, (03), 34116-34121.

INTRODUCTION

As water is the basic need of the habitants, its safeness must be studied before use. The present study aims at detecting the quality of ground water around Jammu city in respect of physico-chemical parameters. Although in rural areas of developing countries, the great majority of water quality problems are related to bacteriological and other biological contaminations, a significant number of very serious problems may also occur as a result of physico-chemical impairment of water resources. With rapid industrialization and urbanization, the Ground water pollution is increasing rapidly. Effect of poor water quality on human health was noted for the first time in 1854 by John Snow, when he traced the out break of cholera epidemic in London to the Thames river water which was grossly polluted with raw sewage. Since then the science of water quality monitoring progressed. In the third world countries 80% of all diseases are directly related to poor drinking water and insanitary conditions. As water is one of the most basic needs of the habitants, its safeness must be

studied before use. The physico-chemical quality of ground water is very important from the health point of view. Thus, constant monitoring of ground water quality is needed so as to record any alteration in quality and out break of health disorders. The present study reports on the ground water quality of ten different locations of Jammu City is as given below. The quality of ground water in the area is generally potable. The present study aims at detecting the quality of ground water of the area in respect of physico-chemical parameters. The possible numbers of such parameters necessary to completely specify the quality of water are very large. However at present twelve parameters are considered to characterize the Ground Water Quality of Jammu City.

MATERIALS AND METHODS

Water samples were collected every month, from January 2019 to Dec 2019 from ten different points as mentioned in the above table, in clean and dry polypropylene bottles. The water samples were collected and preserved for testing of various

Study Area

Sample Code	Name of the station	State	District	Description of the location
S ₁	Munshi chak	J&K	Jammu	It is 10.1 km away from Tawi railway station Jammu.
S ₂	Anand nagar(Bhori)	J&K	Jammu	It is 9.1 km away from Tawi railway station Jammu
S ₃	Tomal bhori	J&K	Jammu	It is 12.2 km away from Tawi railway station Jammu
S ₄	Gulaki chak pulli	J&K	Jammu	It is 9.7 km away from Tawi railway station Jammu
S ₅	Gol-Gujral	J&K	Jammu	It is 9.9 km away from Tawi railway station Jammu
S ₆	Pattachungi (bhori)	J&K	Jammu	It is 8.1 km away from Tawi railway station Jammu
S ₇	Talab tillo(Lane no13)	J&K	Jammu	It is 5.5 km away from Tawi railway station Jammu
S ₈	Gol-Pulli(Talab tillo)	J&K	Jammu	It is 6.4 km away from Tawi railway station Jammu
S ₉	Rajinder Nagar(Bantalab)	J&K	Jammu	It is 13.3 km away from Tawi railway station Jammu
S ₁₀	Ganesh vihar(Camp Gol-Gujral)	J&K	Jammu	It is 10.1 km away from Tawi railway station Jammu



parameters at 10° C throughout the period of chemical analysis. The water samples were analysed in the Indus Basin river water quality Laboratory Centre Water Commission, Jammu using standard methods (APHA 2017). The pH and Electrical Conductivity of the water samples were measured immediately after sampling at the field itself. Samples were subjected to filtration before chemical analysis. The determination of TDS was done by gravimetric process while the total hardness was carried out by EDTA complexometric titration method (APHA 2017). The flame emission photometric method was followed for the estimation of Na and K. Chloride was determined by Argentometric procedure (APHA 2017)[2]. The determination of Sulfate was done by Turbidimetric method (ALPHA 2017).

RESULTS AND DISCUSSION

Temperature: Temperature is an important factor to influence the physico-chemical parameters and the biological reaction in water. Higher values of temperature accelerate the chemical reaction and reduce the solubility of gases and DO. In the present study temperature varied from 22°C to 35°C.

pH: The pH of most raw water sources lies within the range of 6.5-8.5. All the 10 water samples are found to have pH value well within the tolerance limit. The average pH value ranges from 7.06 to 8.36. Munshichak recorded the maximum pH value 8.31 and Tomal Bohri the minimum pH value 7.02.

Electrical Conductivity: Pure water is a poor conductor of electricity. Presence of acids, bases and salts in water make it relatively good conductor of electricity. Greater is the conductivity greater anions and cations in the water and greater is the dissolved matter (electrolyte) in it. Electrical conductivity is used as a basic index in judging the suitability of water for potable properties. Present studies revealed that all the samples recorded conductivity values well within the tolerance limit prescribed by ICMR and WHO. Rajinder Nagar and Ganesh Vihar recorded the highest conductivity value 698 μ mho/cm. The minimum conductivity value 214 μ mho/cm is recorded at Pattachungi (Bohri). Tolerance limit for conductivity in drinking water is 2300 μ mho/cm.

Total Hardness: Hardness of water is the traditional measure of capacity of water to react with soap, hard water requiring a considerable amount of soap to produce lather. Scaling of hot water pipes, boilers and other household appliances is due to hard water. In fresh water, the principal hardness causing ions are calcium and magnesium; the ions strontium, iron, barium and manganese also contribute to some extent. It is expressed as an equivalent concentration of calcium carbonate. The permissible limit of hardness as calcium carbonate is 300 mg/l. Our investigation shows all the water samples are much below the permissible limit. The total hardness is considered taking presence of calcium and magnesium ion in water samples. Its permissible limit is 75 to 200 mg/l. Maximum value was recorded 179 at Anand nagar and minimum value 16 at Rajinder nagar.

Table 1.

Name of the Sampling Station	pH			Conductivity in μ mho/cm			Sulphate(SO ₄ ²⁻) in mg/l		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Munshi chak	8.31	7.12	7.87	571	512	533	1.08	0.86	0.96
Anand nagar(Bohri)	7.99	7.21	7.56	577	77	547	0.91	0.66	0.82
Tomal bohri	7.44	7.02	7.16	356	215	299	1.82	0.77	1.02
Gulaki chak pulli	7.89	7.39	7.63	689	545	621	1.35	0.95	1.11
Gol-Gujral	7.59	7.16	7.30	571	512	047	1.15	0.78	0.96
Pattachungi (bohri)	7.78	7.45	7.66	666	56	588	0.77	0.60	7.13
Talab tillo(Lane no13)	7.79	7.19	7.39	677	61	623	0.77	0.52	0.63
Gol-Pulli(Talab tillo)	7.99	7.35	7.66	689	68	625	0.86	0.59	0.76
Rajinder Nagar(Bantalab)	7.96	7.45	7.62	698	214	343	1.16	0.83	0.98
Ganesh vihar(Camp Gol-Gujral)	7.46	7.21	7.33	698	545	633	0.97	0.58	0.77

Table 2.

Name of the Sampling Station	Calcium (Ca ⁺⁺) in mg/l			Magnesium(Mg ⁺⁺) in mg/l			Total hardness in mg/l		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Munshi chak	39.42	22.19	30.54	2.16	0.68	1.41	98.00	86.00	91.92
Anand nagar(Bohri)	69.91	45.54	58.87	4.89	2.99	3.88	179	159.0	168.37
Tomal bohri	29.99	18.89	26.04	11.12	7.16	8.98	124	98.00	110.17
Gulaki chak pulli	49.16	29.98	39.87	1.99	0.48	0.98	116	89.00	104.25
Gol-Gujral	38.24	20.41	30.04	2.69	1.42	2.10	115	89.00	101.75
Pattachungi (bohri)	19.89	10.49	15.68	2.99	1.26	1.99	59	40.00	49.92
Talab tillo(Lane no13)	33.69	20.62	28.81	11.14	8.89	9.97	132	101.0	120.83
Gol-Pulli(Talab tillo)	48.80	30.26	39.57	6.98	4.44	5.83	155	100.0	138.08
Rajinder Nagar(Bantala)	12.24	6.24	8.80	1.99	0.32	1.16	32	16.00	24.58
Ganesh vihar(Camp Gol-Gujral)	4.80	2.19	3.34	8.96	6.99	7.96	162	133.0	150.75

Table 3.

Name of the Sampling Station	Sodium(Na ⁺) in mg/l			Potassium(K ⁺) in mg/l			Total Dissolved Solids		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Munshi chak	20.20	13.40	18.14	2.80	1.30	1.88	285	26	206
Anand nagar(Bohri)	24.20	19.10	21.89	2.30	1.10	1.82	287	27	252
Tomal bohri	19.90	12.60	18.10	4.90	3.10	3.98	177	106	148
Gulaki chak pulli	55.50	43.20	46.96	2.90	1.40	2.12	345	32	286
Gol-Gujral	57.70	41.40	48.98	2.70	1.00	2.03	285	254	269
Pattachungi (bohri)	28.90	19.90	24.10	1.60	0.80	1.20	347	32	247
Talab tillo(Lane no13)	108.00	11.10	88.98	3.90	2.20	3.09	337	32	281
Gol-Pulli(Talab tillo)	145.00	74.50	97.84	2.80	0.80	2.07	345	261	311
Rajinder Nagar(Bantalab)	32.20	19.90	24.48	1.60	0.60	1.15	196	112	155
Ganesh vihar(Camp Gol-Gujral)	49.60	29.90	42.92	2.80	0.90	2.03	347	32	243

Total Alkalinity: Alkalinity is not a pollutant. It is a total measure of the substances in water that have acid neutralising capacity. Alkalinity indicates the power of a solution to react with acid and buffer its pH, that is the power to restrict its pH from changing. [5] It is due to salts of weak acids and bicarbonates and is estimated in terms of an equivalent amount of calcium carbonate. No permissive and excessive values of total alkalinity are given by WHO, ISI and ICMR. But according to USPHS, the value of total alkalinity as CaCO₃ is 120 mg/l. The average value of total alkalinity in the different sources of water samples of the present observation ranges from mg/l at. The minimum average alkalinity value is recorded at Tomal Bohri(111.0 mg/l) whereas the maximum average value is at Talab Tillo Lane No.13 (399.0mg/l) The alkalinity has no known adverse effect on health, some evidence has been given to indicate its role in heart disease [9].

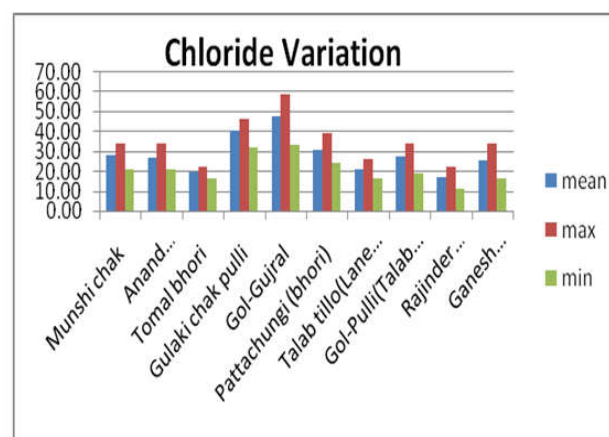
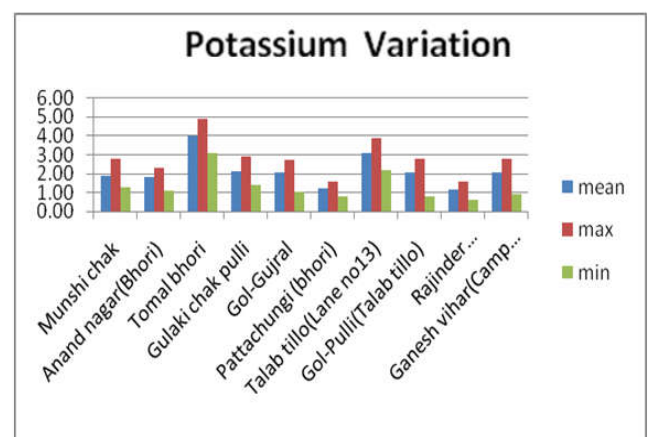
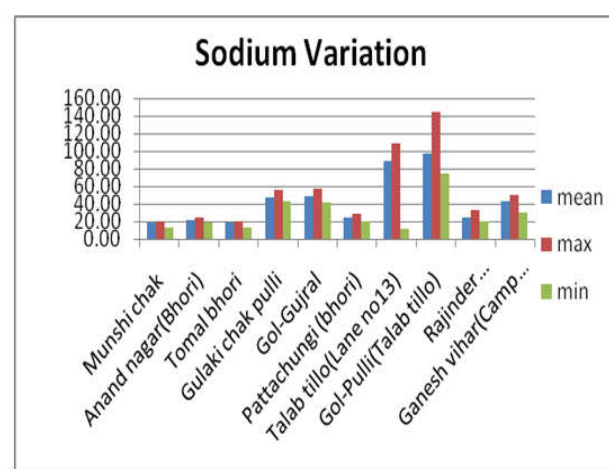
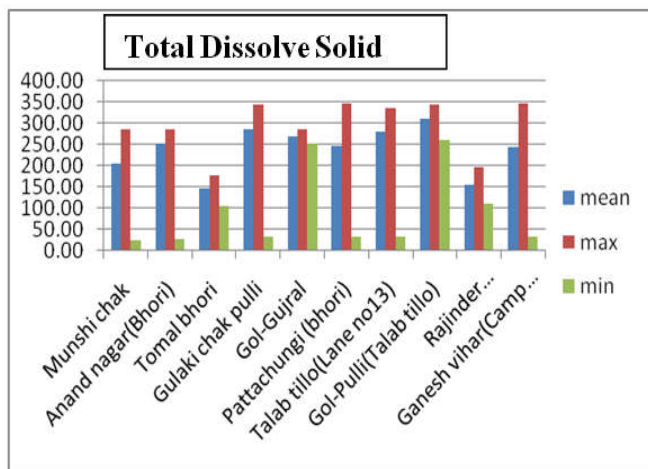
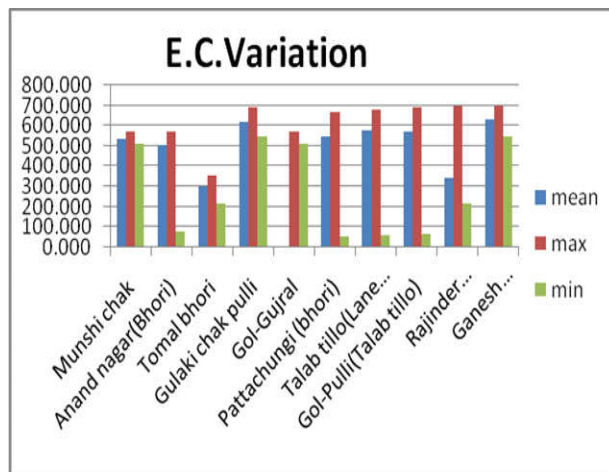
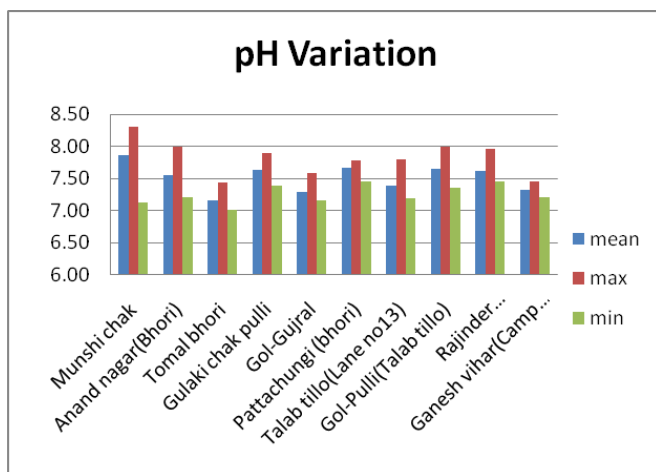
Total Dissolved Solids: Total dissolved solid at a given temperature is the material residue left in the vessel after evaporation of a filtered sample and subsequent drying in an oven. TDS contains different kinds of nutrients and have been proved to be a very useful parameter. A sudden rise in TDS content can often indicate pollution by an extraneous source. Excess amount of TDS may disturb ecological balance and causes imbalance in osmotic regulation and suffocation in

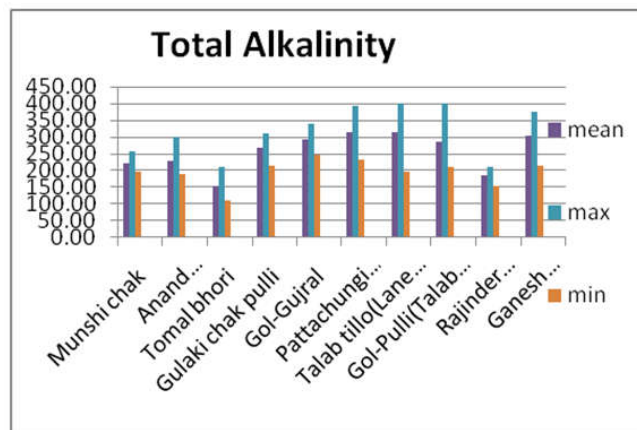
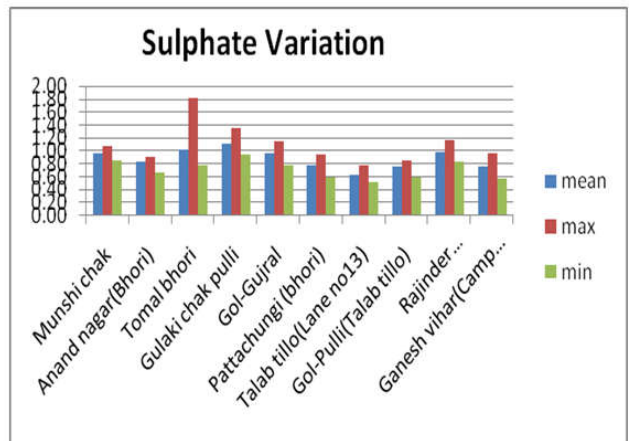
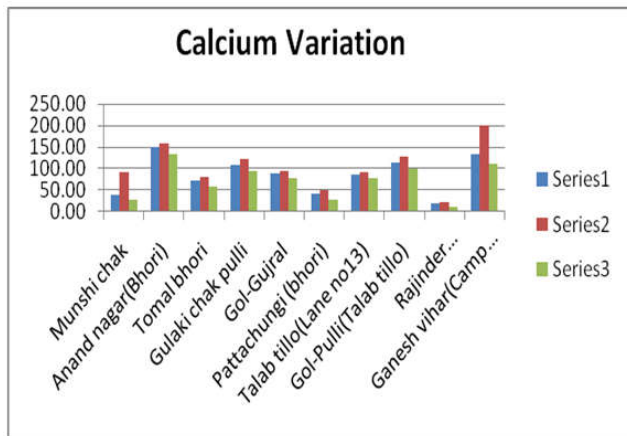
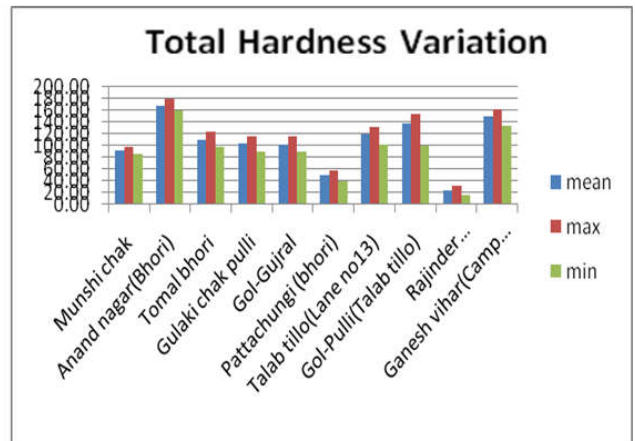
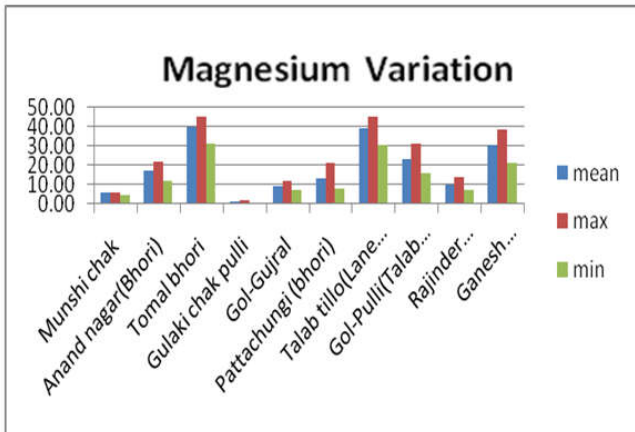
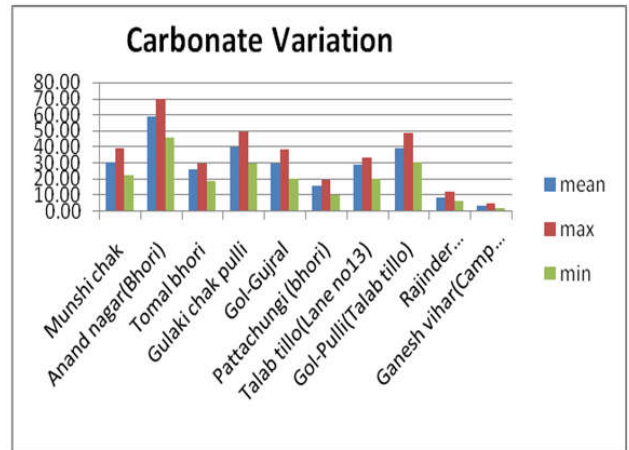
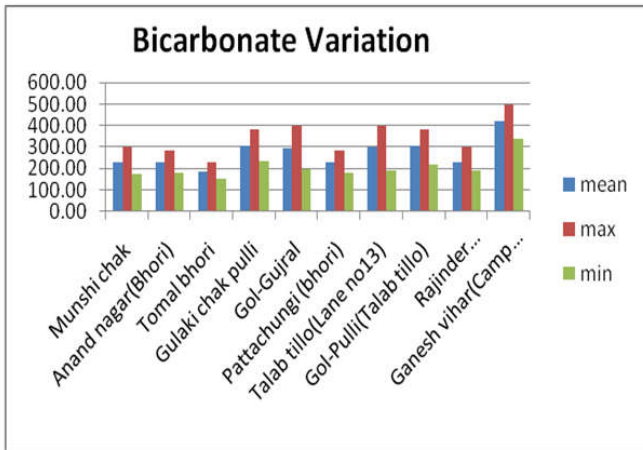
aquatic fauna even in presence of fair amount of dissolved oxygen. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supply and normally less palatable and may induce an unfavourable physiological reaction in the transient consumer. In the present investigation, it is seen that TDS value of most of the water samples are well within the permissible limit. Maximum value was recorded 173 at Rajinder nagar and minimum value 0.11 at Tomal bohri.

Sodium and Potassium: Sodium is the chief cation in the extra cellular fluid. About 50% of body sodium is present in the bone, 40% in the extra cellular fluid and the remaining (10%) in the soft tissues. Whereas potassium is the principal intracellular cation. It is equally important in the extra cellular fluid for specific function such as influencing cardiac muscle activity. According to European economic community the limit for sodium is 200mg/l and for potassium is 10mg/l of drinking water. The study reveals the mean value of sodium and potassium content in the water samples are well within the permissible limit. Maximum value of sodium and potassium was recorded 145 and 4.90 at Gol-pulli (Tillab tillo) and Tomal bohri and Minimum value 11.10 and 0.60 at Talab tillo(lane no 13) and Rajinder nagar.

Table 4.

Name of the Sampling Station	Chloride(Cl ⁻) in mg/l			Carbonate(CO ₃ ²⁻)			Bicarbonate(HCO ₃ ⁻)			Total Alkalinity		
	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
Munshi chak	34.11	21.15	28.00	1.92	1.92	1.60	299.14	174.23	227.96	256.00	198.00	222.67
Anand nagar(Bohri)	34.14	21.12	26.81	0.0	0.0	0.0	283.04	179.34	228.48	299.00	189.00	228.17
Tomal bohri	22.31	16.17	19.83	0.0	0.0	0.0	231.62	154.61	184.47	211.00	111.00	153.92
Gulaki chak pulli	46.28	32.11	40.40	0.0	0.0	0.0	383.42	232.91	303.72	311.00	216.00	266.58
Gol-Gujral	59.15	33.11	47.80	0.0	0.0	0.0	398.49	198.89	292.28	341.00	245.00	292.33
Pattachungi (bohri)	39.08	24.17	30.72	0.0	0.0	0.0	283.04	179.42	229.36	394.00	232.00	312.75
Talab tillo(Lane no13)	26.11	16.12	20.63	0.0	0.0	0.0	399.81	191.62	302.26	399.00	198.00	315.58
Gol-Pulli(Talab tillo)	34.20	19.17	27.74	0.0	0.0	0.0	383.08	219.43	304.22	399.00	212.00	285.58
Rajinder Nagar(Bantalab)	22.16	11.05	16.88	0.0	0.0	0.0	299.41	188.41	230.21	212.00	154.00	187.25
Ganesh vihar(Camp Gol-Gujral)	34.20	16.12	25.39	0.0	0.0	0.0	498.15	339.91	419.63	374.00	216.00	304.75





Sulfate: Most sulfates are soluble in water except of lead, barium, strontium. Concentration of sulfate in most fresh waters is very low. The present study reveals very low concentration of sulfate in the study area with minimum value of 0.52mg/l at Talab tillo(lane no 13)and maximum value 1.82mg/l at Tomal Bohri which are below tolerance limit.

Conclusion

The present study reveals that the water quality of ground water of Talab Tillo Bohri Jammu is quite safe as compared to the physico-chemical parameters point of view at present. However due to increased industrial and human activities a constant monitoring of the water quality of the ground water is a must to maintain the water quality.

Applications: The present study is useful in ascertaining the water quality of ground water of Jammu City for its potability for industrial, agricultural and human use.

REFERENCES

A.K. Bhattacharya, S. Basack and P. Maity, Saline water intrusion in Bhadrak and Balasore district of Orissa, India, 2008, EJGE, 13, 01-07.

B.C.Singh and U.K. Mohapatra, Physico-chemical and Bacteriological Parameters in various sources of Drinking water in the old Capital City of Cuttack,1998, J.T.R. Chem.5(1) 44-50 .

G.J. Henery and G.W. Heinke, 2005, Environmental Science Engineering (2nd Edition), Prentice Hall of India Pvt. Ltd., New Delhi.

Guide lines for drinking water quality, 1984, Vol-3 WHO, Geneva.

Jr. W.J.Webber and W. Stamm, Mechanism of hydrogen ion buffering in natural bigojohi 102 water, Journal of American Water Works Association,1963, 55 ; 1553.

Pradyusa Samantaray, Basant K. Mishra, Chitta. R. Panda and Swoyam P. Rout, Assessment of water quality index in Mahanadi and Atharabanki rivers and Taladanda canal in Paradip area, India, 2009, J. Hum. Ecol. 26(3) 153-161.

Public health service drinking water standards, Rockville, MD, US Department of Health, Education and Welfare, 1962, P-21 (Public Health Service Publication No. 956).

S.A. Iqbal and H.C. Katariya, Physico-chemical analysis and water quality assessment of upper lake of Bhopal. Indian Journal of Environmental Protection, 1995,15(7) 504-509.

Trivedy, R.K.Goel, Chemical and Biological methods for water pollution studies, 1984.

U.Satyanarayan, Biochemistry, 2004, Books and Allied (P) Ltd, P-455
