A study of physico-chemical parameters of springs around Srinagar Garhwal valley, Uttarakhand

Santosh Singh*, R.S. Negi, Rekha Dhanai
Department of Rural Technology H.N.B. Garhwal (A Central) University Srinagar Garhwal (246174), Uttarakhand, India.

Abstract **- Spring water is the main source of water providing life to people in the mountain region especially in the Himalaya. Spring is a natural source of groundwater. Unlike wells, which may be owned and controlled privately; springs are generally community-owned and community-managed. Thus, they give a sense of a "common" resource i.e. groundwater shared through a common mechanism, i.e. the spring. The spring water samples were taken from the main water sources where maximum peoples were using them for drinking purpose. The present study was carried out on the physico-chemical analysis of 5 springs in district Pauri Garhwal of Srinagar Valley viz: Kolun dhara, Beega dhara, Kamleshwar dhara, Hanuman Mandir dhara and Kothar dhara. The samples were collected on monthly basis from March, 2012 to June 2013. The analysed various water parameters viz: Temperature, pH, Conductivity, Total hardness, Chlorides, D.O. and Nitrite. The results indicated that certain sources of water are suitable for drinking and other house hold consumption for the people of the region.**

Keywords **- Spring, Valley, hydrogeology, physico-chemical**

I. INTRODUCTION

The quality of water is a vital concern for mankind, since it is directly linked with human welfare. It is a matter of history that fiscal pollution of drinking water caused water born diseases which wiped out entire population of these cities. At present, the menace of water born diseases and epidemics still booms large on the horizons of developing countries. Polluted water is the culprit in such cases (Nollet, 2000).

Water is the most widely distributed and abundant substances found in nature. The irony is that our planet is a wash with water. In total, there is 1400 million billion liters of water, but most of this water is not used for drinking purpose, because 97% is sea water and only 3% is fresh water, out of which 2% is lidged in the polar ice caps and glaciers, only 1% water is available for portable use; whereas more water goes for irrigation than to drinking sanitation and all other uses (WHO, 2004).

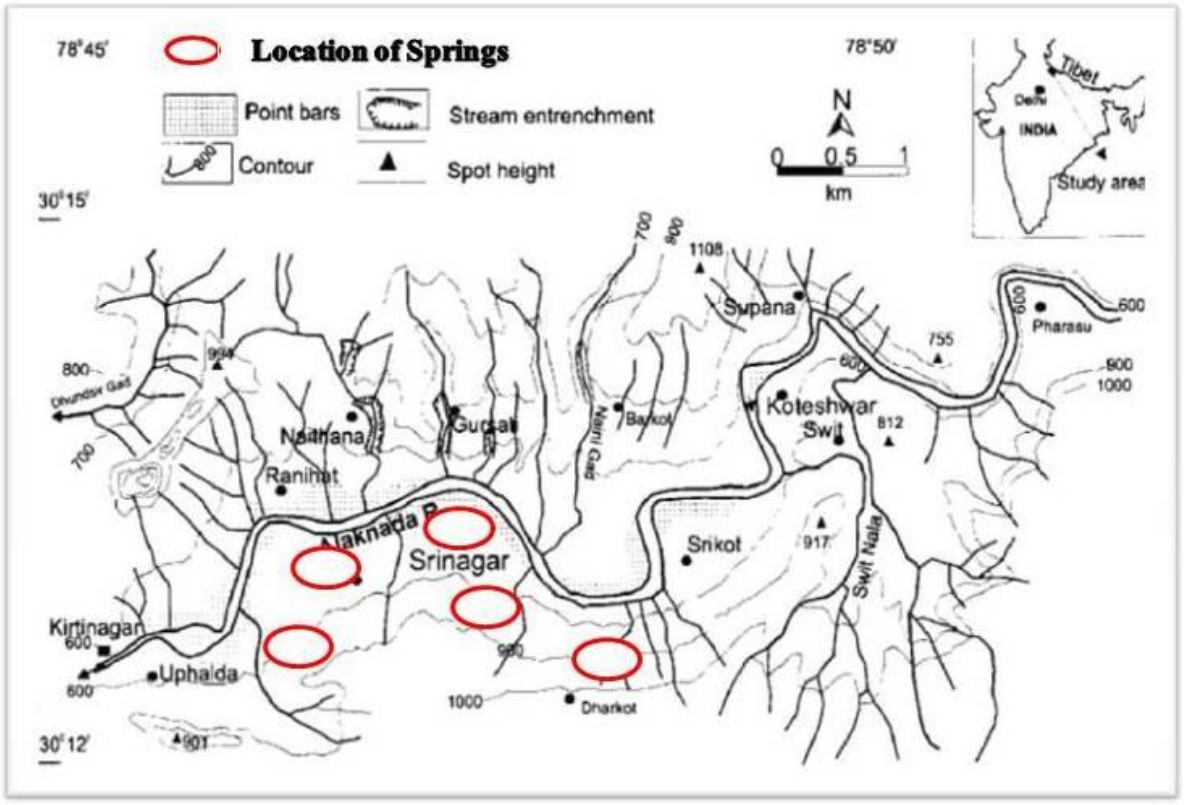
Springs provide the main source of freshwater for drinking and other household consumption in the Indian Himalayan Mountains. People in rural areas of Uttarakhand primarily depend for drinking water on natural water sources such as springs. It also forms a main source of irrigation water in many parts of the mountain region. The mountain springs known as "Dharas"and "Naula". Springs occur where sloping ground and impermeable strata intersect with the ground water table. The water sources of such springs, in most of cases, are unconfined aquifers where the flow of water is under gravity. The objectives of the present study was to analyze the physicochemical parameters of drinking spring water samples collected around from the Srinagar valley of Uttarakhand.

Srinagar valley is located at 30.22°N 78.78°E at the left bank of Alaknanda river. It has an average elevation of 560 metres (1,837 feet). It is the largest city in the Garhwal Hills. Srinagar is the hottest place in the Garhwal Hills in summers as it is at low elevation of just 560 m. and the temperature reaches 45 °C on some days from May to July. It has chilly winters and the temperature can fall to 2 °C in December and January.

II. MATERIALS AND METHOD

The present study was carried out on the spring water quality of five springs of the Srinagar valley in district Pauri Garhwal, Uttarakhand namely; Kolun dhara, Beega dhara, Kamleshwar, Hanuman Mandir dhara, Kothar dhara. Water samples from the various locations of Srinagar valley were collected in clean 1 liter polythene bottles in the month of March 2012 to June 2013. Material requirement for sampling and analysis of water is sample containers, chemical and glassware, thermometer, tissue papers, other field measurement are, field note book, pen, pencil, markers, soap and towel, match box, spirit lamp, etc. All analysis was carried out as per APHA, Indian standard institute and BIS desirable limit for drinking water. Some material and methods are depicted as follows2:

1. Temperature is measured by the thermometer.
2. pH value: pH value in water is determined by pH meter.
3. Conductivity, D.O., in water is determined by the "EUTECH Instrument" of Cyberscan.
4. Total hardness: Hardness in water is determined by EDTA complexometric titration using EDTA solution, buffer solution, EBT indicator, disttilled water and titration apparatus etc.
5. Nitrate: Nitrate in water is determined by UV spectrophotometric method using spectrophotometer, nitrate free water, stock nitrates solution, standard nitrate solution, hydrochloric acid solution
6. Chloride: Chloride in water is determined by argentometric titration method using potassium chromate indicator solution, standard silver nitrate titrant, standard NaCl solution etc.



Fig,1: Location map of springs in study region

III. RESULTS AND DISCUSSION

Table 1 shows average value of physico-chemical analysis of spring water in the present study. The pH values show fluctuations within a range from a minimum of 6.9 (kolun dhara, Beega dhara, and Kamleshwar dhara) to a maximum of 7.2 (Kothar Dhara). However the value for (Hanuman Mandir dhara) that is 7.8. The pH of all the springs is towards the basic level. The desirable limit for pH is 6.0 to 8.0. The electrical conductivity exhibited as a variation within a range from a maximum of 684.01 µs/cm (Kamleshwar dhara) to a minimum of 509.68 µs/cm (Kothar dhara). However the value for (Kolun dhara, Beega dhara and Hanuman Mandir dhara) that is 595.51 µs/cm, 515.89 µs/cm and 530.46 µs/cm. The electrical conductivity values shows fluctuations and may be due to the contamination from domestic sewage and inorganic fertilizer inputs (Kumar et al., 1996) and also may be due to bicarbonate and calcium ions present in the rocks there. The values for temperature within a range from a minimum of 20.69°C (Kolun dhar and kothar dhara) and maximum of 21.5°C (kamleshwar dhara). While the value for Beega dhara and Hanuman Mandir dhara that is, 21.25°C. The temperature values shows significant seasonal variation however the lower temperature may also be due to the shading effect of trees and higher temperature may be due to the high pollution rates. The DO values shows variation within a range from a minimum of 2.5 mg/l (Beega dhara) to a maximum of 3.2 mg/l (Kothar dhara). While the value for (Kolun dhara, Kamleshwar and Hanuman Mandir dhara) that is, 2.89 mg/l, 2.8 mg/l, 3.05 mg/l. The fluctuation in the DO value may be difference in water temperature and also to the greater photosynthetic activity. The chloride values show variation within the range from a minimum of 57.5 mg/l (Beega dhara) to a maximum of 67.88 mg/l (Kamleshwar dhara). However the value for (Kolun dhara, Hanuman Mandir dhara and Kothar dhara) that is, 58.38 mg/l, 59.13 mg/l, 59.5 mg/l. The chloride concentration exhibit small variation within the springs and the variation may be due to the same recharge zone and source of impurities that add chlorides. The total hardness values show fluctuations ranging from a minimum of 211.19 mg/l (Hanuman Mandir dhar) to a maximum of 267.13mg/l (Kamleshwar dhara). While the value for (Kolun dhara, Beega dhara and Kothar dhara), that is, 245.88 mg/l, 220.25mg/l and 218.25mg/l. The variations in the total hardness values, that is, higher values may be due to carbonaceous or lime rich bed rock of the valley. The lower values may be due to seasonal variations. The nitrite values shows variation within a range from a minimum of 4.25mg/l (Kolun dhara) to a maximum of 8.75mg/l (Kothar dhara). While the value for (Beega dhara, Kamleshwar dhara and Hanuman Mandir dhara), that is, 6.25mg/l, 7.5mg/l and 6.13mg/l. The fluctuations in the nitrite values or the higher concentration of nitrogen compounds in water may be due to domestic sewage which enters into the ground water through leeching from soil.

In the present investigation, it was found that almost all water quality paramenters lie within portability range of APHA and WHO, So on the basis of these, water is suitable for drinking and other house hold consumption for the people of the region.

IV. ACKNOWLEDGMENT

The authors are thankful to the Head, Department of Rural Technology of H.N.B. Garhwal University, Srinagar Garhwal, Uttarakhand for providing facilities.

Table, 1: Comparison of mean values of various physico-chemical properties of the water of five springs during the study period.

S. No.	Parameter	Spring Name					SD
		Kolun dhara	Beega dhara	Kamleshwar dhara	Hanuman Mandir dhara	Kothar dhara	
1.	pH	6.9	6.9	6.9	7.1	7.2	0.14
2.	Conductivity (µs/cm)	595.51	515.89	684.01	530.46	509.68	73.72
3.	Temprature (^{0}C)	20.69	21.25	21.5	21.25	20.69	0.37
4.	DO (mg/l)	2.89	2.5	2.8	3.05	3.2	0.27
5.	Chloride (mg/l)	58.38	57.5	67.88	59.13	59.5	4.21
6.	Total Hardness (mg/l)	245.88	220.25	267.13	211.19	218.25	23.37
7.	Nitrate (mg/l)	4.25	6.25	7.5	6.13	8.75	1.68

SD: Standard Deviation

REFERENCE

[1] APHA: Standard methods for examination of water and waste water. 21st Edn., APHA, AWWA, WPCF, Washington DC, (2005).

[2] Bhuiyan, A.S., Q. Nahar and M.N. Islam: Physica-chemical condition in relation to meteorological condition of a fish pond in Rajshahi. Uni. J. Zool. Rajshahi Univ., 16, 85-88 (1997)

[3] Garg, R.K., R.J. Rao and D.N. Saksena: Water quality and conservation management of Ramsagar reservoir, Datia, Madhya Pradesh. J. Environ. Biol., 30, 909-916 (2009).

[4] Jha, P. and S. Barat: Hydrobiological study of lake Mirik in Darjeeling, Himalaya. J. Environ. Biol., 24, 339-344 (2003).

[5] Kumar, N., A. Singh and P. Sharma: To study the Physico-Chemical properties and Bacteriological examination of Hot Spring water from Vashisht region in Distt. Kullu of H.P., India. Int. Res. J. of Environ. Sci., 2, 28-31(2013).

[6] Kumar P.B.A.N, V. Dushenkov, H. Motto and I. Raskin: Phytoextraction: The use of plants to remove heavy metals from soils. Environ. Sci. Technol. 29, 1232-1238 (1996).

[7] Nollet L.M.L.: Handbook of Water Analysis. Marcel Dekker, New York, USA, pp. 87-99 (2000).

[8] Pandit, A.K.: Freshwater Ecosystems of the Himalaya. Parthenon Publishing, New York, London, (1999).

[9] Rautshnyak, A.A., M.G. Borisovich, V.S. Vallev, D.V. Ivanov, M.G. Andreeva and M.V. Trushin: The hydrochemical and hydrobiological analysis of the condition of the Kuibyshv reservoir littorials (Republic of Tararstan, Russia). Ekoloji, 16, 22-28 (2006).

[10] Smitha, D. Ajay and P. Shivashankar: Physico Chemical Analysis of the Freshwater at River Kapila, Nanjangudu Industrial Area , Mysore, India, Inter. Res.J. of Enviro. Scie., 2 , 59-65 (2013).

[11] Solanki, M.K. and O.P. Gupta: Physico-chemical and comparative analysis of river water, underground water and surface water of Rewa city MP, India, Poll Res., 32 (2) 235-237 (2013).

[12] Thresh J.C., E.V. Suckling and J.F. Baele: The Examination of Water Supplies 6th edition (E.W. Taylor, ed.) (1976).

[13] World Health Organization: WHO Guidelines for drinking-water quality. 3rd edition. Geneva, pp. 3-6 (2004).