JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

"Study the Physio-Chemical Properties of hot water source of Pahad Karwa, Wadraf Nagar, Sarguja division of Chhattisgarh, India."

Shailesh Kumar Dewangan* Savitri Saruta ** Preti Sonwani ***

Asst. Professor & HOD Department of Physics, Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur

M.Sc.-I Semester Physics, Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur

Asst. Professor Department of Physics, Shri Sai Baba Aadarsh Mahavidyalaya Ambikapur

1. Abstract:-

We are doing research in a place where hot water flows automatically. The name of this place is Pahad Karwa. This place is located in the Surguja division of Chhattisgarh state in India, where hot water flows continuously from an old well. The main objective of our research is to see how the water coming out from the source of hot water continuously from this place will affect the agriculture sector and humans. For this, a sample of the water coming out of this place will be taken. And the physico-chemical properties of that water will be known. Under Physio-Chemical Properties, we will find pH-value, Conductivity of water and study the presence and quantity of metals like Chloride(Cl), Nitrates(NO_3), Calcium(Ca), Magnesium(Mg), Iron(Fe), Fluoride(F), Sulfate(SO_4) etc of the water here. And try to reach some conclusion. So far 22 hot springs have been discovered in our country. This could be the 23rd hot spring of our country.

Keywords:- Hot water source, Hot spring, Conductivity, Pahad karwa, Resistive, pH-Value, Physical properties, Chemical properties etc.

Introduction :-

Pahar Karva is the place from where hot water flows continuously from an old well. This place is located in Balram district of Surguja division of Chhattisgarh state,INDIA, which is located in Wadraf Nagar block of Balrampur district, Pahad Karva is a small village whose core area is only 426 hectare, it is a backward village. Where there is no road to reach this hot spring. This place is located at a distance of 62 kms from Ambikapur, the headquarter of Surguja division of Chhattisgarh and 426 kms from Raipur, the capital of Chhattisgarh. Whose geographic location is on Latitude $23^0$35'57.773"N and Longitude $83^0$13'44.918". In this Balrampur district of Chhattisgarh there is a place called Tatapani which is known as Hot Spring, many research has been done here. The distance from Tatapani to Pahar Karwa is 73 kms.

Conductivity :- Conductivity is a measure of water's capability to pass electrical flow. This ability is directly related to the concentration of ions in the water[1]. These conductive ions come from dissolved salts and inorganic materials such as alkalis, chlorides, sulfides and carbonate compounds [2]. Compounds that dissolve into ions are also known as electrolytes [3]. The more ions that are present, the higher the conductivity of water.

pH-value :- **pH is a determined value based on a defined scale, similar to temperature. This means that pH of water is not a physical parameter that can be measured as a concentration or in a quantity.[4],[5]**

Density:-The density of water is the weight of the water per its unit volume, which depends on the temperature of the water. The usual value used in calculations is 1 gram per milliliter (1 g/ml) or 1 gram per cubic centimeter (1 g/cm^3). [7]

Surface Tension:- The drop weight method is an accurate yet simple technique for determining surface tension σ. It relies on dripping a liquid of density ρ at a low flow rate ˜Q from a capillary of radius R into air and measuring the combined volumes of the primary and satellite drops that are formed.[8]

Viscosity:- The viscosity of a fluid is a measure of its resistance to deformation at a given rate. For liquids, it corresponds to the informal concept of "thickness": for example, syrup has a higher viscosity than water.[9]

Material & Methods :-

To find the Physico-chemical properties of the water in the Pahad Karwa where hot water flows continuously from an old well, we took two water samples from the source of water and the way of flow of water. And the sample taken by us was tested for pH value, conductivity, chloride, nitrate, calcium, magnesium, iron, fluoride, sulfate etc.

1.Conductivity :-

With the help of conductivity meter, the water sample taken from mountain karva was inspected, in which the conductivity of the water sample taken from the source was 612 micro-mhos/cm and the conductivity of its sample taken from the way of flow was 634 micro-mhos/cm. it occurs. We have taken this observation at room temperature [3].

3.Surface tension:-

When we find the surface tension from the drop-weight method of the water taken from pahad karwa, we get the surface tension of water 65.80 Dy/cm. We have taken this measurement at 25^{0}C. Whereas Distilled Water Surface Tension 71.97Dy/cm it happens. This is standard value of surface tension of distilled water.

The Observation table of water sample at source of Pahad Karwa are-

S.No.	Weight of beaker	No. of drops	total weight 50 drops
1	28.5	0	0
2	31	50	2.5
3	33.5	100	2.5
4	35.2	150	2.7
Average weight of 50 drops of pahad karwa W_{PK}			2.55

The Observation table of Distilled water are-

S.No.	weight of beaker	No. of drops	total weight 50 drops
1	28.5	0	0
2	31	50	2.5
3	33.5	100	2.5
4	36	150	3.5
Average weight of 50 drops (W_{DW})			2.83

We know that standard value of surface tension of distilled water is 71.97Dy/cm then the surface tension of water of pahad karwa is-

$$\sigma_{PK} = (W_{PK} / (W_{DW}))*\sigma_{DW}$$
$$= (2.56/2.8)*71.97$$
$$= 65.80 \text{ Dyn/cm}$$

4.pH-value:-

By measuring the ph value of the water sample taken from Pahad karwa with the help of ph-meter, we get the pH value of the water sample taken from the source as 9.0 And the pH value of the water sample taken from on the way of water flow is 8.5

5.Viscosity:-

When we measured the Viscosity with the help of VISCO meter, we got to know the samples taken from the Pahad karwa.

Viscosity of water taken from Pahad karwa, is more than Viscosity of Distilled Water.

Viscosity of water of ultapani=$9.16*10^{-3}$Dyn.s/cm^2

Viscosity of distilled water =$8.90*10^{-3}$ Dyn.s/cm^2

After doing a Physio-chemical test of the sample taken from the research area Pahad Karwa, the name and quantity of the chemical found in the water are as follows. The amount of chemical in it is taken in milligram per centimeter.

Physio-Chemical Properties	Acceptable	Cause of rejection	First sample (Source)	Second Sample (On the way)
pH Value	6.5-8.5	8.5-9.2	9.00	8.5
Conductivity			612	634
Chlorides	200	1000	73.0	68.0
Nitrates	45	45		
CaCo3	200	600	34.20	34.20
Calcium	75	200	9.88	7.60
Magnesium	30	150	2.30	3.69
Iron	0.1	0.1		
Fluorides	1.0	1.5	5.00	4.50
Sulphates	200	400	10.0	10.0

Result & Discussion :-

From the testing of water samples, it is known that a place called Pahar Karva, located in Barti kalan village, is the source of hot water. The pH value of this water is higher than normal and the pH value of the flow of water decreases at some distance from the source. The amount of fluoride is 5 times higher than normal. If there is an excess of fluoride in water, a disease called Fluorosis. Before this disease, teeth are damaged, bones start crooked." One liter of drinking water should not contain more than one milligram of fluoride[by WHO]. Values of Sulphate, magnesium and calcium are very less than normal.

Excess fluoride. Where practicable, monitor the prevalence of enamel Fluorosis using scoring guidance systems such as those developed by WHO.[20]. Provide drinking-water with Fluoride levels that do not produce adverse health effects, by: seeking alternative water sources in areas with fluoride-rich groundwater, particularly where water consumption is high due to elevated temperatures; [21], Research the appropriateness of various community fluoridation schemes in view of natural fluoride levels in water. Monitor fluoride levels in the environment, especially in areas where there is exposure to elevated fluoride levels due to human activities, and determine the overall exposure to Fluoride[19].

Conclusion:-

Excess of fluoride are in both sample hence this Water Sample are not suitable for drinking purpose. The amount of fluoride in the water here is 5 times more than the normal. High intake of fluoride, via ingestion or inhalation from different sources cause toxicity in humans and plants. The problems of fluoride contamination in groundwater is a major concern. Plants species susceptibility to fluoride pollution may be severely damaged. Considering all these issues, fluoride toxicity and its mitigation mechanisms became a noticeable complication to the agricultural scientists for getting stable yield under the influence of fluoride stress[16].

the presence of a high concentration of F in soil affects plants and aquatic life and leads to soil and water pollution. Plants species with a susceptibility to F pollution in soil may be drastically damaged. In addition, F pollution may have a devastating effect on the microbial activity in soil and disrupt the soil ecology[17].

References:-

[1]. EPA. (2012). 5.9 Conductivity. In Water: Monitoring and Assessment. Retrieved from http://water.epa.gov/type/rsl/monitoring/vms59.cfm

[2]. Perlman, H. (2014). Electrical Conductivity and Water. In The USGS Water Science School. Retrieved from http://ga.water.usgs.gov/edu/electrical-conductivity.html

[3].Milliequivalents, Millimoles, and Milliosmoles (Powerpoint). (n.d.). In University of Michigan.Retrieved from http://sitemaker.umich.edu/tutorial/files/handout_milliequiv.pdf

[4]. Merriam-Webster. (2013). pH. In Merriam-Webster Dictionary . Retrieved from http://www.merriam-webster.com/dictionary/ph

[5]. Ophardt, C. E. (2003). pH. In Virtual Chembook. Retrieved from http://www.elmhurst.edu/~chm/vchembook/184ph.htm

[6]. Nave, C. R. (2001). pH as a Measure of Acid and Base Properties. In HyperPhysics. Retrieved from http://hyperphysics.phy-astr.gsu.edu/hbase/chemical/ph.html

[7].https://www.thoughtco.com/what-is-the-density-of-water-609413

[8]. Ozgur E. Yildirim, Qi Xu, and Osman A. Basarana! "An improved drop-weight method for measuring surface tension" https://www.researchgate.net/publication/252862556, Received 13 September 2004; accepted 11 March 2005; published online 13 June 2005

[9].https://en.wikipedia.org/wiki/Viscosity

[10].Hanan Alwediyani, Aisha Almasoudi, Anwar Abdulrahman "The Change in Physical Properties of Magnetic Water"

[11] Ahmed, S.M. Effect of Magnetic Water on Engineering Properties of Concrete. College of Engineering , Water Resources Department University of Mosul , Iraq. 2008 5

[12] Reddy, B.S.K., Ghorpade, V.G. ,Rao, H.S. Influence of Magnetic Water on Strength Properties of Concrete. Indian Journal of Science and Technology.7 1:14-18. 2014

[13] Joshi, K., Kamat, P. ,INDIAN, J. Effect of magnetic field on the physical properties of water. J .Ind. Chem. Soc.43:620-622. 1966

[14]Hanan Alwediyani, Aisha Almasoudi, Anwar Abdulrahman "The Change in Physical Properties of Magnetic Water"

[15]https://www.fondriest.com/environmental-measurements/parameters/water-quality/conductivity-salinity-tds/

[16] Saroj Choudhary, Mukta Rani, O Siva Devika, Abhik Patra, Rajesh Kumar Singh and Saroj Kumar Prasad "Impact of fluoride on agriculture: A review on it's sources, toxicity in plants and mitigation strategies" International Journal of Chemical Studies 2019; 7(2): 1675-1680

[17] M. Ranjith a*, S. Sridevi b#, K. Jeevan Rao a and T. Ramesh c≡"Fluoride in Groundwater, Its Variation with Seasons and Relationship with Other Water Quality Parameters in Rangareddy District of Telangana, India" International Journal of Plant & Soil Science 34(12): 1-9, 2022; Article no.IJPSS.83996 ISSN: 2320-7035

[18] . WHO (2017). Guidelines for drinking-water quality, 4th edition incorporating the first addendum. Geneva, World Health Organization, pp. 370–373
(https://apps.who.int/iris/bitstream/handle/10665/254637/9789241549950-eng.pdf).

[19] WHO-CED-PHE-EPE-19 "PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS" file:///C:/Users/ASUS/Downloads/WHO-CED-PHE-EPE-19.4.5-eng.pdf

[20] WHO (2013). Oral health surveys – Basic methods, 5th ed. Geneva, World Health Organization (https://apps.who.int/iris/bitstream/handle/10665/97035/9789241548649_eng.pdf).

[21]. WHO (2006). Fluoride in drinking-water. Geneva, World Health Organization (https://www.who.int/water_sanitation_health/publications/fluoride_drinking_water_full.pdf).