WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 5, 955-967. Research Article ISSN 2277– 7105

STUDY OF COMPARISON OF FRESH AND DRAINAGE WATER CONDUCTOMETRYCALLY OF LABS FROM GOVT.HOLKAR SCIENCE COLLEGE, INDORE

Nameeta Bende*

Govt. Holkar Science College, Indore.

Article Received on
03 Feb. 2019,

Revised on 24 Feb. 2019,
Accepted on 17 March 2019

DOI: 10.20959/wjpr20195-14541

***Corresponding Author**
Dr. Nameeta Bende
Govt. Holkar Science College, Indore.

ABSTRACT

The study was made in Govt. Holkar Science College, Indore. Different laboratories have been chosen for the study. Fresh water has been same as the source in each laboratory was same that is tube well. Only the difference was the drainage water which has been collected from the outlet of different laboratories. Conductometry is a technique of determining Conductance of the sample using conductometer. The study was made to determine the use of drainage water for plants in the garden situated near by laboratories. Chemicals used in each laboratory were harmful or not for plants and insects, were the significance of the study. Conductivity of a substance is defined as 'the ability or power to conduct or transmit heat, electricity, or sound'. Pure water is not a good conductor of electricity. Because the electrical current is transported by the ions in solution, the conductivity increases as the concentration of ions increases. Thus conductivity increases as water dissolved ionic species. Water having high conductance has no use for irrigation of plants.

KEYWORDS: Laboratories, Conductometry, Plants, Chemicals.

INTRODUCTION

Water is an important natural resource on earth. It is necessary for all living organisms, ecological system, human health, food production and economic development. Water is a transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's streams, lakes, and oceans, and the fluids of most living organisms. It is vital for all known forms of life, even though it provides no calories or organic nutrients.

Different types of water present on the earth: Fresh water (drinking water), sea water and sewage water etc.

Freshwater is water that has little or no dissolved salts and dissolved solids. This excludes sea or marine waters and brackish water. All over the world, water comes in other forms such as ice-sheets, glaciers, lakes, ponds, rivers, streams and icebergs. The quantities found in every geographic area may vary.

Sea water (salty water) is water from a sea or ocean. On average, seawater in the world's oceans has a salinity of approximately 3.5%, or 35 parts per thousand.

Sewage water is wastewater from people living in a community. It is the water released from households after use for various purposes like washing dishes, laundry, and flushing the toilet waste water of laboratories, thus the name wastewater. The used water moves from the houses through pipes installed during plumbing.

CHEMICAL AND PHYSICAL PROPERTIES OF WATER

1. State

Solid, liquid, and gas are the three states of water. When water goes below 32 degrees F, it is ice (solid), when water goes above 212 degrees it evaporates (gas). Inbetween these temperatures water is in its liquid state. Water exists in three states gaseous, solid, and liquid.

2. Taste and odor

Pure water is usually described as tasteless and odorless, although humans have specific sensors that can feel the presence of water in their mouths, and frogs are known to be able to smell it. However, water from ordinary sources (including bottled mineral water) usually has many dissolved substances, that may give it varying tastes and odors. Humans and other animals have developed senses that enable them to evaluate the potability of water by avoiding water that is too salty or putrid.

3. Color and appearance

The apparent color of natural bodies of water (and swimming pools) is often determined more by dissolved and suspended solids, or by reflection of the sky, than by water itself. Light in the visible electromagnetic spectrum can traverse a couple meters of pure water (or ice) without significant absorption, so that it looks transparent and colorless. Thus aquatic plants, algae, and other photosynthetic organisms can live in water up to hundreds of meters deep,

because sunlight can reach them. Water vapour is essentially invisible as a gas. Polarity and hydrogen bonding.

4. Electrical conductivity and electrolysis

Pure water has a low electrical conductivity, which increases with the dissolution of a small amount of ionic material such as common salt. Liquid water can be split into the elements hydrogen and oxygen by passing an electric current through it—a process called electrolysis. The decomposition requires more energy input than the heat released by the inverse process (285.8 kJ/mol, or 15.9 MJ/kg).

5. Reactivity

Metallic elements which are more electropositive than hydrogen such as lithium, sodium, calcium, potassium and calsium displace hydrogen from water, forming hydroxides and releasing hydrogen. At high temperatures, carbon reacts with steam to form carbon monoxide.

SOURCES OF WATER

1. Ground Water

Groundwater is water that is found underground within rocks. Its presence depends primarily on the type of rock. Permeable rocks have tiny spaces between the solid rock particles that allow water and other fluids to pass through and to be held within the rock structure. The layers of rock that hold groundwater are called aquifers. Groundwater in an aquifer is replenished by rain and other forms of precipitation (any form of water, such as rain, snow, sleet or hail that falls to the Earth's surface. The level of water below ground is called the water table. Groundwater can be extracted from wells or collected from springs.

2. Well Water

Well water as a source of water can be described by their depth, or by the way they are constructed. Most especially they use different types of pump at the surface to raise the water. The pump is usually used to retrieve water and it go through an extensive filtration or decontamination process either naturally or chemically. There are two major types of well water.

3. Rain Water

Rain water is the source of water that comes from above the clouds, this water is very pure. Until it encounter something on it way down. However if it is stored properly it may relinquish clean drinking water. In regions where rainfall is abundant and frequent, rainwater can be a good source of water supply for individual, families and some communities. The storage of rainwater is particularly important in areas with a long dry season, or where spring water is difficult to obtain. The term rainwater harvesting is sometimes used. It simply means collecting, or harvesting, rainwater as it runs off from hard surfaces and storing it in a tank or cistern.

4. Surface Water

Surface water is easily the most abundant supply of natural water. The downside is that most of the surface water on the planet is salt water so it is not ideal for drinking for most living species. Surface water does play an important part in our daily lives in addit Surface water is used to produce hydro-electric power as a clean energy source that is also renewable. Surface water is supplied by precipitation, springs and ice melting from higher elevations and glaciers. Ion to being a source of drinking water.

5. Snow melt

Melting snow is another natural source of water when melted in great amounts can yield clean drinking water especially once boiled.

6. Lake and River Water

Lakes and rivers provide much water to wild animals and if cleaned and filtered properly it could become clean enough to drink for humans. Most countries with access to lakes and rivers use their water for human consumption. This source of water supply is usually regularly replenished by various weather events.

7. Salt water from oceans

Ocean water can effectively be processed for consumption through the desalinisation process removing excess salt. Without this process the water becomes counter-active and actually dehydrates you.

USES OF WATER

Agriculture

The most important use of water in agriculture is for irrigation, which is a key component to produce enough food. Irrigation takes up to 90% of water withdrawn in some developing countries[34] and significant proportions in more economically developed countries (in the United States, 30% of freshwater usage is for irrigation).

For drinking

The human body contains from 55% to 78% water, depending on body size.[43] To function properly, the body requires between one and seven liters (0.22 and 1.54 imp gal; 0.26 and 1.85 U.S. gal) of water per day to avoid dehydration; the precise amount depends on the level of activity, temperature, humidity, and other factors.

Washing

The propensity of water to form solutions and emulsions is useful in various washing processes. Washing is also an important component of several aspects of personal body hygiene. Most of personal water use is due to showering, doing the laundry and dishwashing, reaching hundreds of liters per day in developed countries.

Transportation

The use of water for transportation of materials through rivers and canals as well as the international shipping lanes is an important part of the world economy.

Chemical uses

Water is widely used in chemical reactions as a solvent or reactant and less commonly as a solute or catalyst. In inorganic reactions, water is a common solvent, dissolving many ionic compounds, as well as other polar compounds such as ammonia and compounds closely related to water. In organic reactions, it is not usually used as a reaction solvent, because it does not dissolve the reactants well and is amphoteric (acidic and basic) and nucleophilic. Nevertheless, these properties are sometimes desirable. Also, acceleration of Diels-Alder reactions by water has been observed. Supercritical water has recently been a topic of research. Oxygen-saturated supercritical water combusts organic pollutants efficiently. Water vapor is used for some processes in the chemical industry. An example is the production of acrylic acid from acrolein, propylene and propane. The possible effect of water in these

reactions includes the physical-, chemical interaction of water with the catalyst and the chemical reaction of water with the reaction intermediates.

Fire extinction

Water is used for fighting wildfires. Water has a high heat of vaporization and is relatively inert, which makes it a good fire extinguishing fluid. The evaporation of water carries heat away from the fire. It is dangerous to use water on fires involving oils and organic solvents, because many organic materials float on water and the water tends to spread the burning liquid. Use of water in fire fighting should also take into account the hazards of a steam explosion, which may occur when water is used on very hot fires in confined spaces, and of a hydrogen explosion, when substances which react with water, such as certain metals or hot carbon such as coal, charcoal, or coke graphite, decompose the water, producing water gas.

Industrial applications

Many industrial processes rely on reactions using chemicals dissolved in water, suspension of solids in water slurries or using water to dissolve and extract substances, or to wash products or process equipment. Processes such as mining, chemical pulping, pulp bleaching, paper manufacturing, textile production, dyeing, printing, and cooling of power plants use large amounts of water, requiring a dedicated water source, and often cause significant water pollution.

Food processing

Boiling, steaming, and simmering are popular cooking methods that often require immersing food in water or its gaseous state, steam. Water is also used for dishwashing. Water also plays many critical roles within the field of food science. It is important for a food scientist to understand the roles that water plays within food processing to ensure the success of their products.

Medical use

Water for injection is on the World Health Organization's list of essential medicines.

Water industry

The water industry provides drinking water and wastewater services (including sewage treatment) to households and industry. Water supply facilities include water wells, cisterns for rainwater harvesting, water supply networks, and water purification facilities, water tanks,

water towers, water pipes including old aqueducts. Atmospheric water generators are in development.

EFFECTS OF SEWAGE WATER

Agriculture / Fisheries / Tourism

Wastewater for irrigation may contain unsuitable chemicals and higher concentrations of nutrients needed for crops. This can result in delayed and under yielding. Wastewater used for animal farming may also contain harmful things and chemicals dissolved in them. Animals may die, and there is a chance that humans that eat such animals may be harmed too. In some places, faecal sewage is discharged directly into the sea. The discharge contains pathogens and harmful dissolved chemicals which can affect fishing in that area. The smell and such behavior does not encourage tourism to that area.

Health of urban and rural populations

Wastewater is a big health issue, as it carries and transports a myriad of diseases and illnesses. It is believed that about 2.2 million people die each year (globally) from diarrhoeal disease. (WHO) At least 1.8 million children under five years die every year due to water related disease, or one every 20 seconds (WHO, 2008).

Physicochemical Parameters for Testing Water

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physic-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we going to use that water and what extent we need its quality and purity. Water does content different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity, electrical conductivity, TDS etc, while chemical tests should be perform for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characters. For obtaining more and more quality and purity water, it should be tested for its trace metal, heavy metal contents and organic i.e. pesticide residue. It is obvious that drinking water should pass these entire tests and it should content required amount of mineral level.

Electrical conductivity (conductance)

Electric current is the flow of electrons through a material, and electric conductivity is the ability of electric current to flow through a material.

Conductivity measures the water's ability to conduct electricity. It is the opposite of resistance. Pure, distilled water is a poor conductor of electricity. When salts and other inorganic chemicals dissolve in water, they break into tiny, electrically charged particles called ions. Ions increase the water's ability to conduct electricity. Common ions in water that conduct electrical current include sodium, chloride, calcium, and magnesium. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases.

There are several factors that determine the degree to which water will carry an electrical current. These include:

1) The concentration or number of ions;
2) Mobility of the ion;
3) Oxidation state (valence) and;
4) Temperature of the water.

Environmental impactof electric conductivity of water

Conductivity is a measurement used to determine a number of applications related to water quality. These are as follows:

1) Determining mineralization: this is commonly called total dissolved solids. Total dissolved solids information is used to determine the overall ionic effect in a water source. Certain physiological effects on plants and animals are often affected by the number of available ions in the water.
2) Noting variation or changes in natural water and wastewaters quickly;
3) Estimating the sample size necessary for other chemical analyses; and
4) Determining amounts of chemical reagents or treatment chemicals to be added to a water sample.

Conductivity of water is important because it reveals water's salinity and the concentration of other minerals and contaminants. Environmentalists can use conductivity to track the movement of water systems in order to predict and solve problems with marine life. Conductivity tests demonstrate the connection between soil conditions and drought, heavy

rain, and other environmental conditions that could affect farming and crop yield. It takes the guess work out of whether to irrigate or fertilize.

Aquatic animals and plants are adapted for a certain range of salinity. Outside of this range, they will be negatively affected and may die. Some animals can handle high salinity, but not low salinity, while others can handle low salinity, but not high salinity. In addition to its direct effects on aquatic life, salinity also has many other important effects on water chemistry and water density.

Bacteriological, physicochemical and mineral analysis of water used in abattoirs in Ado-Ekiti, Southwest Nigeria is studied by Odeyemi and coworkers.[1] Water Quality Investigation by Physicochemical Parameters of Drinking Water of Selected Areas of Kureken Sani, Kumbotso Local Government Area of Kano is studied by Aminu Sharif Hassan and coworkers.[2] Analysis of Water for the Presence of Pollutants by using Physicochemical Parameter in Control Water, Polluted and Treated Hussainsagar Lake Water, Hyderabad, Telangana, India is studied by Sreenu Noothi and coworkers.[3] Analysis of water quality parameters of groundwater near Ambattur industrial area, Tamil Nadu, India is studied by K. Saravanakumar and coworkers.[4]

Assessment of Water Quality Index for the Groundwater in Tumkur Taluk, Karnataka State, India is studied by C. R. Ramakrishnaiah and coworkers.[5] The Correlation and Regression Analysis of Physicochemical Parameters of River Water for the Evaluation of Percentage Contribution to Electrical Conductivity is studied by Arun Kumar Shrestha and coworkers.[6] Applying fluorescence spectroscopy and multivariable analysis to characterize structural composition of dissolved organic matter and its correlation with water quality in an urban river is studied by Huibin Yu and coworkers.[7] Ground Water and River Quality Assessment for Some Heavy Metals and Physicochemical Parameters in Wukari Town, Taraba State, Nigeria is studied by M. O. Aremu and coworkers.[8] Spatiotemporal Variability in Microbiological Water Quality of the Białka River and Its Relation to the Selected Physicochemical Parameters of Water is studied by Anna Lenart-Boroń and coworkers.[9] Evaluation of bacteriological and physicochemical quality of water supply systems in Welkite Town, Southwest-Ethiopia is studied by Dessalew Berihun and coworkers.[10]

MATERIAL AND METHODOLOGY

Sample Collection

Samples of tap water and sewage were collected from following laboratories of Govt. Holkar Science College, Indore, MP: Zoology Lab. Chemistry Lab. No 1, Chemistry Lab. No 3, Botany Lab., Biochemistry Lab., Biotechnology lab.and Microbiology Lab.

METHODOLOGY

Electrical conductivity of samples of sewage water and tap water of different laboratories was measured with the help of digital conductivity meter: Model – Systonic, conductivity meter 304 (65/359/0) in BHAGWAT LABORATORY NO 6. In Govt. Holkar Science College, Indore, MP.

RESULT AND DISCUSSION

Table for comparison ofelectrical conductivity offresh tap water and sewage water of various laboratories.

S.no	Name of Laboratory	Electrical Conductivity of Tap Water in (Ms/Cm)	Electical Conductivity of Sewage Water in (Ms/Cm)
1.	Zoology Lab.	0.70	4.9
2.	Chemistry Lab. No. 1	0.51	0.94
3.	Chemistry Lab. No. 3	0.55	0.56
4.	Botany Lab.	0.75	0.79
5.	Biochemistry Lab.	0.83	160
6.	Biotechnology Lab.	0.82	0.92
7.	Microbiology Lab.	0.78	0.34

Conductivity measures the water's ability to conduct electricity. It is the opposite of resistance. Pure, distilled water is a poor conductor of electricity. When salts and other inorganic chemicals dissolve in water, they break into tiny, electrically charged particles called ions. Ions increase the water's ability to conduct electricity. Common ions in water that conduct electrical current include sodium, chloride, calcium, and magnesium. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increase.

From the table electrical conductivities of tap water and sewage water of Zoology lab.are0.70 ms/cm and 4.9 ms/cm respectively. This difference in electrical conductivities occurred because at the time of sample collection, practical in the lab was going on. And there were many anions and cations were present in the sewage water.

Electrical conductivities of tap water and sewage water of Chemistry lab.No 1 are0.51ms/cm and 0.94 ms/cm respectively. This difference in electrical conductivities occurred because at the time of sample collection, practical was going on in the lab. and there were anions and cations were present in the sewage water.

Electrical conductivities of tap water and sewage water of Chemistry lab.No 3 are 0.55 ms/cm and 0.56ms/cm respectively. There is no difference in electrical conductivities because at the time of sample collection, no practical was going on in the lab.

Electrical conductivities of tap water and sewage water of Botany lab.are 0.75 ms/cm and 0.79 ms/cm respectively. This slight difference in electrical conductivities occurred because at the time of sample collection, no practical was going on in the lab.

Electrical conductivities of tap water and sewage water of Biochemistry lab.are 0.83 ms/cm and 160ms/cm respectively. This majordifference in electrical conductivities occurred because at the time of sample collection, practical was going on in the lab. and there was a huge no of anions and cations present in the sewage water.

Electrical conductivities of tap water and sewage water of Biotechnology are 0.82 ms/cm and 0.97 ms/cm respectively. This difference in electrical conductivities occurred because at the time of sample collection, practical was going on in the lab. And there were some anions and cations were present in the sewage water.

Electrical conductivities of tap water and sewage water of Microbiology lab. are 0.78 ms/cm and 34 ms/cm respectively. This major difference in electrical conductivities occurred because at the time of sample collection, practical was going on in the lab. and there were many anions and cations were present in the sewage water.

CONCLUSION

The more impure water, the more electric conductivity it has. The highest value of electric conductivity of fresh water and sewage water is of sample of fresh water and sewage water of biochemistry lab which is 0.83 ms/cm and 160 ms/cm respectively, it indicates that fresh water and sewage water of this lab is more impure (more anions and cations are present in sample water of this lab) in comparison of sample water of other laboratories. And the lowest value of electric conductivity of fresh water is of sample of fresh water of Chemistry lab No. 1 which is 0.51 ms/cm. and the lowest value of electric conductivity of sewage water is of

sample of sewage water of Chemistry lab No. 3 which is 0.56 ms/cm, it shows that fresh water and sewage water of this lab is more pure.

The highest difference in values of electrical conductivity of fresh water and sewage water is difference in values of electrical conductivity of sample of fresh water and sewage water of Biochemistry laboratory, which is 159.18ms/cm (160-0.82)ms/cm. And the lowest difference in values of electrical conductivity of fresh water and sewage water is difference in values of electrical conductivity of sample of fresh water and sewage water of Chemistry lab No 3, which is 0.01 ms/cm(0.56-.55)ms/cm.

As the value of electrical conductivity of sewage water of Biochemistry lab is highest therefore it is most harmful for plant and animals as well as human and environment.

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