

A COMPARATIVE STUDY OF WATER FROM DIFFERENT SOURCES AND THEIR ANALYSIS

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ABSTRACT

- In the 21st Century, Water Crisis has been an issue of utmost importance. From the availability of water to the quality of water that is accessible to the people, it becomes important for one to know that if the water that we are consuming contains an appropriate amount of minerals or not. Is the best quality of water that we are been provided with or can efforts be made to get even a better quality of water? In order to bring a conclusion out of the mentioned questions, a few samples of the water obtained from different filtration systems and a sample of the rainwater were collected and studied so as to study the mineral content present in them and analyse as to which system provided the best quality of water. Moreover, the impact on water when it is kept in containers made up of materials like plastic, Soil, Brass etc. were also analysed. The samples have been tested on various parameters like salt, mineral and bacterial content. More specifically for the amount of minerals provided by each were analysed. On the basis of the results obtained, a conclusion was drawn along with the suggestions on how to enhance the quality of water used for day to day purposes and move a step forward towards tackling the problem of water crisis at personal level.

➤ WATER INSIDE HUMAN BODY

- Around 14 Minerals are required by the human body.
- Includes -
- ☐ Cations: Ca²⁺, Mg²⁺, K⁺, Cu²⁺, Zn²⁺, Fe²⁺, Mn²⁺.
- ☐ Non metals: I, Se.
- ☐ Anions: Cl⁻, MO₄⁻, PO₄³⁻, F⁻.
- ☐ Additional Elements: B, Cr, Ni, Si, V, Co.
- The minerals in combined form affect :
 - ☐ Bone and Membrane Structure (Ca, P, Mg, F);
 - ☐ Water and electrolyte Balance (Na, K, Cl);
 - ☐ Metabolic Catalysis (Zn, Cu, Se, Mg, Mn, Mo);
 - ☐ Oxygen binding (Fe), and
 - ☐ Hormone functions (I, Cr).

➤ TOTAL DISSOLVED SALTS

- Electrical conductivity of water is directly related to the concentration of dissolved ionized solids in the water.
- Ions from the dissolved solids in water create the ability for that water to conduct an electric current, which is measured using a conductivity meter i.e. TDS meter.



- TDS meter measures total dissolved solids (TDS) of a solution, i.e. the concentration of dissolved solid particles.
- TDS meters display the TDS in parts per million (ppm); 1 ppm indicates 1 milligram of dissolved solids per kilogram of water.

➤ TDS RANGE FOR DRINKING WATER

TDS Level (Milligram/Litre)	Palatability of Water
Less than 300	Excellent
300-500	Good
600-900	Fair
900-1200	Poor
Above 1200	Unacceptable

TDS Level (Milligram/Litre)	Remarks
Less than 50	Unacceptable because of lack of important minerals
50 - 150	Acceptable for Drinking (Excellent - where water is polluted with industrial wastes and sewage)
150 - 250	Good - Acceptable for Drinking (Healthiest in regard to cardiovascular health.)
250 - 350	Good - Acceptable drinking (Healthy in regard to cardiovascular health.)
350 - 500	Fair
500 - 900	Less Acceptable for Drinking
900 - 1200	Least acceptable for drinking; try to avoid drinking water with TDS level above 900 wherever possible
1200 - 2000	Very Least acceptable for drinking where other water sources are not available.
Above 2000	Unacceptable for drinking

- The Upper Limit of TDS level in drinking water set by Bureau of Indian Standards (BIS) is 500 ppm (500 milligrams per liter).
- Water with TDS <100 has high dissolvent capacity & dissolves a small quantity of plastic, in which it is kept.

➤ WATER PURIFIERS

- RO (Reverse Osmosis) Water Purifiers**
 - Involves passing of water at high pressures via thin film composite membrane.
 - Helps reduce the quantity of salts & minerals dissolved in water by approx 90%, i.e. to a level that's healthy & permissible.
 - Hard water may contain dissolved minerals & salts like arsenic, iron, mercury, lead, fluoride and nitrates etc.
 - Eliminates any physical, chemical or biological contaminants & hence, waterborne diseases.
 - Ideal for regions receiving hard water having high level of Totally Dissolved Salts (TDS).
- Aqua guard Water Purifiers**
 - Purifies Water in three steps:
 - Bacterial and Particulate Removal is done via a pre-filter membrane with a mesh size of 1 micron.
 - Removal of hardness from water supply. It is done via a softener element i.e. Zeolite based, a natural volcanic mineral based material.
 - Treating with a high quality activated carbon element. Activated carbon binds up & removes organic & inorganic materials via adsorption.
 - Ideal for Bore Water Supply & Municipal Water.

➤ VESSELS USED FOR STORING DRINKING WATER

- BRASS**
 - Brass (Brass = 60% Copper+ 40% Zinc)
 - Carries medicinal properties that gets leached into the water when stored in them. Known as 'Tamra-Jal'.
 - Influence of Cu on health is because: It is part of enzymes, that are proteins aiding occurrence of biochemical reactions in cells.
 - Cu involved in absorption, storage & metabolism of Iron.
 - **Benefits of Copper:** Healthy growth, Regulates blood flow, Aids heart problems, Helps loose extra fat, Lustrous skin, Prevents Anaemia, Cough, Acidity, Piles, Etc.
 - **Benefits of Zinc :** 40% Zinc from the Brass helps human body as - Improves resistance power to diseases, Improves skin tone and cures skin problems, Nourishes healthy hair.
 - **Deficiency of Copper :** Loss of resistance power to diseases, Severe anaemia, Skin diseases, Abnormalities in bones like weakening of bones leading to frequent fracturing.
 - **Deficiency of Zinc :** Slow & improper growth in kids, Hamper resistance power to diseases, Loss of appetite, Loss of wound healing capacity.



- CLAY MUDPOT/EARTHEN POT**
 - Alkaline nature of clay interacts with acidity of water & ensures proper pH balance.
 - Helps curb acidity & relieves gastronomic pains.
 - Naturally cooled water from clay pots is readily absorbed by the body & is loaded with micro-nutrients that it soaks up from the kiln fired earthen pot.
 - Earthen pot : Provides healing elements of Earth. Transfers coolness to the water in sync with the climatic conditions; that no other container does.

➤ OUR STUDY

- ☐ **pH TESTS**
 - The Colour Obtained for all the Water Samples Was Green, indicating the neutrality of the Water i.e. a pH of 7.

☐ TDS(TOTAL DISSOLVED SALTS) TESTS

PARAMETERS	AQUAGUARD SAMPLE (PPM)	RO SAMPLE (PPM)
ORIGINAL	103	23
BRASS VESSEL	114	35
EARTHEN POT	292	98
PLASTIC	103	25



➤ RAINWATER

- Of All the circulation of water, rainwater is the foremost in the cycle.
- Untreated rainwater can be consumed it is pure, distilled water evaporated from the sun.
- The chain :
 - Tap water - Water pipe - Filtration plant -
 - Water intake system - The river or Lake -
 - Water from the valley - Rainwater.
- Acidity of clean water is 5.6pH , thus, all the rain on the earth is acidic. Region having source of air pollution, the acidity is stronger and hence, with a pH of 3-4.
- Acidity of other liquids is more than acid rain (eg: Carbonated Drinks-2.5pH).
- Acidic Rain once gathered, turns alkaline with a pH of 7-8.5 i.e. the pH of neutral water. Hence, Safe to use.
- Lower region has more pollutants than the upper region. TDS of lower region of river is higher than the upper one.
- Hence, valley water in mountain of upper region has far less TDS values.
- Thus, TDS of rainwater before it falls on the ground is the lowest.
- Within 20 minutes of pouring rain, pollutants dissolved are washed away. Thus, rainwater is like distilled water.
- Can be cleaned via precipitation techniques, boiling, and can be stored for 5-6 months.

PARAMETER	RAINWATER (PPM)
ORIGINAL	12
EARTHEN POT	78
BRASS	24
PLASTIC	12



➤ CONCLUSION

- The Water Purifier should be chosen carefully taking into account the source of water.
- In the process of obtaining clean water, demineralisation occurs. It can be remineralized by choosing earthen pots, brass vessels, etc over plastic containers.
- In order to end the upcoming water crisis, it is mandatory to switch onto collecting fresh rainwater and obtaining its fortification naturally.

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