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Traditional Water Sources Are More Qualitative Than Non-Traditional Water Sources

A.K. Siroya
Associate Professor,
Deptt. of Zoology,
S.D. Government College,
Beawar, Rajasthan
India

Nisha Siroya
Assistant Professor,
Deptt. of Zoology,
S.D. Government College,
Beawar, Rajasthan
India

Abstract

Water is known to be a universal solvent and considered as a very dilute solution of number of chemicals essentials for maintaining equilibrium in biochemical reactions taking place in all living organisms in order to maintain the physiology. The present investigation is **aimed** at understanding the water quality of different sources. Ground water and surface water can be found almost everywhere. The ground water table may be deep or shallow and may rise or fall depends on many factors. These factors affect water quality of the particular source. Heavy rains or melting snow may cause the water table to rise or heavy pumping of ground water supplies may cause the water to fall. Physico-chemical parameters of different traditional and non-traditional water sources were analyzed to find out their physico-chemical status. Parameters like pH, chloride, total dissolved solid, fluoride, nitrate *etc*. were taken into consideration and their comparison have been made to explore the suitability for human beings. The results indicate that water quality of traditional sources is better than non-traditional sources. Suggestions have been incorporated for the improvement of traditional water sources.

Keywords: Traditional Water Sources, Water Quality, Fluoride And Total Dissolved Solids.

Introduction

"Water is food and fire is the eater of the food. Fire is established in water and Water is established in fire"

-Taittiriya Upanishad 3.8

Water is essential to all known forms of life and is also known as the universal solvent. It is the most used matter on earth. Significance of water as a powerful natural agent is determined not only by its abundances on the surface of the earth, but also its remarkable chemical and physical properties. Water for an environmental Engineer is not merely a compound of two parts of hydrogen and one part of oxygen [H_2O] as it is for a student of classical chemistry. Water is considered as a very dilute solution of number of chemicals essentials for maintaining equilibrium in biochemical reactions taking place in all living organisms in order to maintain the body physiology. Water found in nature is never H_2O alone. Hence it can be considered as a separate entity as a whole and can be expressed explicitly by the chemical formula as [H_2O + X] where X is measurable and controllable. The X in uncontrolled conditions causes diseases. Water pollution means when insoluble solid particles, soluble salts, sewage garbage, industrial wastes, algae, bacteria etc. mixed into water, water gets polluted and pollution is called water pollution. Water fit for human consumption specially for drinking purpose is called "potable water" or drinking water.

Water that is not specifically made for drinking, but is not harmful for human beings when used for food preparation is called safe water. Traditional step-wells are called *vav* or *vavadi* in Gujarat, *baolis* or *bavadis* in Rajasthan and northern India. Usually for strategic and Philanthropical reasons these water sources were built. They were secular structures from which everyone could draw water. Most of them are defunct today. A major reason for the breakdown of this traditional system is the pressure of centralization and agricultural intensification.

Ground water can be found almost every where. The water table may be deep or shallow and may rise or fall depending on many factors.

Heavy rains or melting snow may cause the water table to rise or heavy pumping of ground water supplies may cause the water to fall. Ground water supplies are replenished or recharged by rain and snow melt. In some areas of the world people face serious water shortages because ground water is used faster than it is naturally replenished. In other areas ground water is polluted by human activities. The intensive use of natural resources and the large production of industrial waste in modern society often pose threat to ground water quality and have already resulted in many incidents of ground water pollution.

Review of Literature

Man has been interested in ecology in a practical sort of way since early in his history. In primitive society every individual, to survive, needed to have definite knowledge of his environment, *i.e.*, of the forces of nature and of the plants and animals around him. Since water is both an essential and the most abundant substance in protoplasm, it might be said that all life is "aquatic". The aquatic environment plays a very pertinent and significant role in the life of all living organisms, and as such its study has directed the attention of researchers towards it from the very beginning. With the growth of population, industries and increasing volume of various waste effluents, the pollution of water has become a matter of concern.

Amiraly *et al* (2004) revealed in their paper on "Rainwater harvesting, alternative to the water supply in Indian urban areas" calculated that water scarcity is a main feature of north-western states of India.

Bhandari and Khare (2006) observed that though water is not strictly a "public good". Like India, in most countries it has been a convention that water supply and provision is the government's realm. India has blessed with some of the best natural water resources in the world. The study analyses the problems with urban water supply in Delhi and other regions of India. It examined the adverse human and environmental impacts of unpriced water which is supplied inefficiently by the public sector.

Twenty Indian states have excess fluorides in the groundwater (Susheela 2001). Araral (2010) in his study pointed that rising populations are facing challenges in managing urban water demand, looming water scarcity is on high speed and urbanization is on rising trend.

Jethoo and Poonia (2011) in their study found that in past few years, ground water level in India especially in Rajasthan is going down. Water resources of Rajasthan are completely or are at the verge of drying that making the State drought like situation. Major cities like Jaipur and Ajmer are facing a grave problem of drinking water, leading to acute shortage of drinking water. Unfortunately, the human behavior towards water conservation is not changing with diminishing resources of drinking water. People were using much more water than it is needed. The issue should be addressed immediately by changing public perception towards water use and resources through media, department concern and by organizing public awareness programs.

Methodology

The water quality of different traditional and non-traditional water sources have been studied in the present investigation. All the samples were examined for different parameters viz. pH, chlorides, nitrate, hardness, total dissolved solids and fluoride as per standard methods prescribed in APHA.

Table No.01

S. no.	Parameters	Methods
1	pH	Direct pH meter
2	Total hardness	By titration
5	Chloride	By titration
6	Nitrate	Rubbing method
8	Total dissolve solid	Conductivity bridge
7	Fluoride	Ion selective electrode

Result and Discussion

All parameters of water viz,: pH, chloride, total dissolved solid, fluoride, nitrate *etc*. should be in fixed concentration. If one of these parameters are in unlimited concentration than it may cause disease and such water is known as impure water which can't be used for drinking purpose. Water works as a solvent in all metabolic reactions of human body and water parameters beyond the limits may cause metabolic reactions uncontrolled creating various abnormalities in the form of disease.

Many diseases are caused by impure water like diarrhea, cholera, etc. and in addition to this digestive system, respiratory system, blood circulation system are also disturbed. Fluoride ions are important in water supply because of their peculiar characteristics though health problems may arise from either its deficiency or excess. Fluoride enters the human body through drinking water and causes mild molting and staining of teeth; its high concentration may also act as a carcinogenic agent. Fluoride contents in enamel, plague, saliva, urine, nails, bones and hair are directly related to fluoride levels of drinking water and dietary fluoride intake.

Table No.02

Water Source Types →		**Non-Traditional Sources**		**Traditional Sources**	
Water samples / Parameters	**BIS Standards**	**Tap water**	**Tube well**	**Open well**	**Step well**
1. pH	7.75	8.0	7.8	8.0	7.8
2. Total Hardness	300 mg/l	60	190	160	60
3. Chloride	250 mg/l	40	400	80	40
4. Nitrate	45 mg/l	10	05	20	10
5. T.D.S.	500 mg/l	229	1450	512	235

6. Fluoride	1.0 mg/l	0.5	1.2	0.8	0.5

Nitrates are more dangerous to human health especially in case of infants below 6 months of age. Methaemoglobinemia or blue baby disease is caused by excess of nitrate in drinking water. Cancer Research campaign in U.K. has shown the direct relationship between stomach cancer and nitrate rich drinking water. Higher concentration of total dissolved solid may cause gastro-intestinal irritation while water taste is affected if iron concentration is not within limit as it is common in fourteen states of India. Water becomes toxic due to abnormal arsenic concentration, it is also known to cause chromosome damage and interfere with the process of heredity in man. pH values of water affect the mucous membrane.

Conclusion

The course of investigation is based upon observations obtained from four water sources among them two were non-traditional (tube-well and tap water) while two were traditional (step-well and open-well). In this investigation the results indicate that water quality of traditional sources is better than non-traditional sources. Chloride content of tube well is very high in comparison to traditional sources. Total Dissolved Solids and Fluoride are also found very high in comparison to traditional sources. Results also indicate that the water quality of step well is almost parallel to tap water witch is supplied by government from the potable water source. The studies conclude that the traditional water sources are better than non-traditional water sources.

Some Traditional Water Sources of India

Talab / Bandhis /Johad

Talabs are water reservoirs. They may be natural or human-made. A reservoir area of less than five bighas is called a talai; a medium sized lake is called a *bandhi* or *talab*; bigger lakes are called *sagar* or *samand*. The *pokhariyan* serve irrigation and drinking purposes. When the water in these reservoirs dries up just a few days after the monsoon, the pond beds are cultivated with rice and wheat. *Johads* are small earthen check dams that capture and conserve rainwater, improving percolation and groundwater recharge.

Nadis / Naada / Bandha

Nadis are village ponds, found in Rajasthan. They are used for storing water from adjoining natural catchments during the rainy season. The site was selected by the villagers based on an available natural catchments and its water yield potential. Water availability from *nadi* would range from two months to a year after the rains. *Naada/bandha* are found in the *Mewar* region of the Rajasthan. It is a stone check dam, constructed across a stream or gully, to capture monsoon runoff on a stretch of land. Submerged in water, the land becomes fertile as silt deposits on it and the soil retains substantial amounts of water.

Rapat

A *rapat* is a percolation tank, with a bund to impound rainwater flowing through a watershed and a waste weir to dispose of the surplus flow. If the height of the structure is small, the bund may be built of masonry, otherwise earth is used. *Rapats* in Rajasthan, being small, are all masonry structures. *Rapats* and percolation tanks do not directly irrigate land, but recharges well within a distance of 3-5 km downstream. Silting is a serious problem with small *rapats* and the estimated life of a *rapat* varies from 5 to 20 years.

Kuis / Beris

Found in western Rajasthan, these are 10-12 meters deep pits dug near tanks to collect the seepage. *Kuis* can also be used to harvest rainwater in areas with scanty rainfall. The mouth of the pit is usually made very narrow with inside broad area to capture more water. The pit gets wider as it burrows under the ground, so that water can seep in into a large surface area. This prevents the collected water from evaporating. The openings of these entirely *kuchcha* (earthen) structures are generally covered with planks of wood, or put under lock and key. The water is used sparingly, as a last resource in crisis situations.

Baoris / Bers

These are the step-wells. *Baoris* or *bers* are community wells, found in Rajasthan, that are used mainly for drinking. Most of them are very old and were built by *banjaras* (mobile trading communities) for their drinking water needs. They can hold water for a long time because of almost negligible water evaporation.

Jhalaras

Jhalaras were human-made tanks, found in Rajasthan and Gujarat, essentially meant for community use and for religious rites. *Jhalaras* are ground water bodies which are built to ensure easy & regular supply of water to the surrounding areas. The *jhalaras* are often rectangular in shape with steps on three or even on all the four sides of the tank. The steps are built on a series of levels. The *jhalaras* collect subterranean seepage of a *talab* or a lake located upstream means water harvesting in highest level. The water from these *jhalaras* was not used for drinking but for only community bathing and religious rites.

Recommendations and Suggestions

1. The indigenous technologies should be adopted to make water fit for drinking after treatment such as defluoridation, desalination etc. The hand pump attached defluoridation plants based on activated alumina should be generated.
2. Traditional water harvesting devices should be encouraged like *baories*, wells and *kunds* etc. All traditional water harvesting devices should be rejuvenated.
3. Research and development should continue on defluoridation technology. Different defluoridation techniques have been given by some Scientists.
4. Water fairs and awareness programs should be organized by Government and Non Government Organizations in problematic parts of rural areas.
5. People should be educated about their health concern and they should be known about water quality of the source whether water is potable or not, by Government agencies or NGOs.

6. Rain water harvesting and differential use of water sources should be promoted vigorously in the water quality affected areas. The hydro geological information of the problematic area like hydro geological formation, water table level etc. are essential to decide about type and design of recharge structure.
7. A prolonged and sustainable community surveillance system should be put in place for water quality.
8. Construction of wells at the places, where these are easily recharged by rain water to avoid tapping of fluoride rich ground water.
9. Villages are having more than one source of fluoride less than 1.5 ppm; in these villages people should be motivated to use only these sources for drinking and cooking purposes.
10. Water recharging activities with rain water may be initiated in villages having high fluoride, total dissolve solid, chloride, and nitrate or where all the four parameters are altogether beyond the permissible limits.
11. Following type of Rain water harvesting techniques can be used in different problematic condition.

Urban areas

1. Roof top and storm water harvesting to store water in storage tanks for immediate use
2. Artificial ground water recharge through dug well, tube well, hand pumps, recharge shafts, trenches and pits.

Rural areas

1. Residential roof top water harvesting
2. Storm water harvesting

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