Kakatiya Government College, Hanamkonda.

(Accredited with NAAC 'A' Grade)

Student Study project on

A Study on RO Water Purifying Plants in Telangana ~~and~~

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Project Completion Certificate

Date: 23/12/2017

This is to certify that Mr. / Ms. B.Bharath II MPC E/M, N.Madhukar II MPC E/M G.Prakash Reddy I MPC E/M, G. Uday Kiran I Biotech E/M, T.Nainesh I Biotech E/M. students of Department of Chemistry ,Kakatiya Government College, has undergone a Project work under the supervision of Sri. Adama Srinivas Reddy and Sri Gollapudi RaviKumar.

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A Study on RO Water Purifying Plants in Telangana

Relevance of the topic:

It is said by the scientists that the discovery of RO technique is one of the most useful ones for common man as it can decrease almost all 30 percentage of general diseases which are water borne. So the usage of RO water has increased phenomenally. But the commercial production of RO water is not maintained according to the standards particularly it is more acidic in nature and less in TDS value, this resulting into many health problems. So this Study on RO Water Purifying Plants gives an idea how the commercial RO plants are not according to the standards and gives knowledge about the acceptable standards of portable water to the students

Objectives

General :

- To inculcate the research aptitude among the students
- To buildup problem solving skills among the students
- To develop entrepreneurship skills and to generate self employment among the students.

Specific:

- To know about the standards of RO water plants.
- To study the PH, TDS, and ORP levels of RO water plants (mineral water plants).
- To assess the health problems due to non maintenance of standard in production of mineral water

Methodology:

Servey and experimentation

Collection of samples:

Eleven Parakal, Mulugu, Jammikunta, Godavarikhani, Husnabad, Karimnagar , Kazipet

Warangal, Hanamkonda, Station Ghanpur, Paloncha water samples were collected from the various parts of the Telangana and Andhra Pradesh. Total dissolved solids (TDS), PH, Conductivity parameters were measured for the ground water and water purified plants.

Experimentation

For the calculation of PH EI PH meter is used. The HANNA company ORP meter is used for the knowing the ORP values. The TDS meter is used for the finding the TDS values.

Introduction:

Jean-Antoine Nollet was the first chemist to observe the property of osmosis through semi permeable membrane in 1748. In 1949 researcher from university of California and university of Florida produced the pure water from the sea water, but they could not get the pure water in the huge amount. The Reverse Osmosis technique was utilized commercially by the end of 2011.

At present the Nellore krishnapatnam power plant is successfully running on the reverse osmosis technique. Huge amount of demineralised water is required for generation of steam to run the turbine. So the power plant is producing demineralised water from sea water, the sea water has the conductivity value around 50000 micro-Siemens per centimeter.

Collection of samples:

eleven water samples were collected from the various parts of the Telangana and Andhra Pradesh. Total dissolved solids (TDS), PH, Conductivity parameters were measured for the ground water and purified water plants.

S.No	Name of the village/City	TDS (ppm)	PH	ORP mv
1	Parakal	625	7.12	399
2	Mulugu	554	7.38	325
3	Jammikunta	570	7.21	387
4	Godavarikhani	785	7.10	452
5	Husnabad	952	7.24	495
6	Karimnagar	319	8.01	228
7	Kazipet	495	7.05	492
8	Warangal	526	7.15	485
9	Hanamkonda	487	7.08	428
10	Station Ghanpur	623	7.02	525
11	Paloncha	352	8.22	159

Table1: Water Ground Parameters

S.No	Name of the village/City	TDS (ppm)	PH	ORP mv
1	Parakal	45	6.24	208
2	Mulugu	38	4.80	285
3	Jammikunta	16	6.29	325
4	Godavarikhani	28	6.12	485
5	Husnabad	55	6.25	510
6	Karimnagar	18	6.58	245
7	Kazipet	25	6.05	582
8	Warangal	48	6.15	555
9	Hanamkonda	41	6.28	483
10	Station Ghanpur	36	6.22	615
11	Paloncha	49	6.82	253

Table2: RO water Parameters

The table 1 showing the very high TDS values in the various parts of the Telangana and Andhra Pradesh. The WHO guidelines indicating the drinking water has certain parameters like TDS, PH, and conductivity.

TDS means Total dissolved solids which is used to learn how much amount of inorganic salts and organic matter present in the water. Normally our ground water contains inorganic salts like calcium, sodium, magnesium, potassium cations and sulphates, chlorides, carbonates, hydrogen carbonates as anions.

Normally ground water contains high TDS value due to which it is tasteless. The drinking water to have a good taste, the TDS should be less than 500mg/lit. As the TDS value goes on increasing the water taste become tasteless. The threshold TDS value for drinking water is 900mg/lit

In our survey the TDS value for ground water is above 500mg/lit. Hence the peoples are not taking the ground water for drinking purpose.

Maintenance of PH value in drinking water:

PH is used to know whether water is acidic or alkaline. Normally PH values are in the range of 0 to 14. If the value is less than 7 the water is acidic in nature. Water is alkaline when PH is above 7.

Surface water has the PH value in between 6.5 to 8.5, whereas ground water has the PH value in between 6.0 to 8.5.

In our survey the PH value of ground water in the Telangana and Andhra Pradesh lies in between 7.0 to 8.5. The WHO norms regarding the potable water also in the same range, but due to high TDS value this water is not potable

The PH value of RO purified water has 6.0 so it is 10times more acidic than the threshold value i.e. 7.0. So it is not safe to drink the RO purified water having PH 6.

Role of PH on Humans health:

When people used to take the high TDS water for drinking they may suffer from cancer [1] coronary heart disease[2] cardiovascular diseases [4, 5] this is not proved scientifically yet till date. But usually high value of TDS indicates the possibility of presence harmful contaminants such as sulphates, Arsenic. If the sulphate concentration is high in our drinking water there is possibility of formation of gastric ulcers, high concentration of Arsenic leads to cancer in the human beings.this low value of PH value of RO water leads to gastric ulcers.

GENERAL DESCRIPTION

The pH of a solution is the negative common logarithm of the hydrogen ion activity: pH = -log (H+) In dilute solutions, the hydrogen ion activity is approximately equal to the hydrogen ion concentration. The pH of water is a measure of the acid–base equilibrium and, in most natural waters, is controlled by the carbon dioxide–bicarbonate–carbonate equilibrium system. An increased carbon dioxide concentration will therefore lower pH, whereas a decrease will cause it to rise. Temperature will also affect the equilibria and the pH. In pure water, a decrease in pH of about 0.45 occurs as the temperature is raised by 25 °C. In water with a buffering capacity imparted by bicarbonate, carbonate, and hydroxyl ions, this temperature effect is modified [10]. The pH of most raw water lies within the range 6.5–8.5[10].

ANALYTICAL METHODS The pH of an aqueous sample is usually measured electrometrically with a glass electrode. Temperature has a significant effect on pH measurement[10,11].

RELATIONSHIP WITH WATER-QUALITY PARAMETERS

The pH is of major importance in determining the corrosivity of water. In general, the lower the pH, the higher the level of corrosion. However, pH is only one of a variety of factors affecting corrosion [13–17].

EFFECTS ON LABORATORY ANIMALS:

When solutions differing in pH were injected into the abdominal skin of mice, skin irritation was manifested at pH 10 after 6 h[18]. In the rabbit, intracutaneous skin irritation was observed above pH 9.0[18]. In addition, a pH above 10 has been reported to be an irritant to the eyes of rabbits[18]. No significant eye effects were reported in rabbits exposed to water of pH 4.5 [19].

EFFECTS ON HUMANS

Exposure to extreme pH values results in irritation to the eyes, skin, and mucous membranes. Eye irritation and exacerbation of skin disorders have been associated with pH values greater than 11. In addition, solutions of pH 10–12.5 have been reported to cause hair fibres to swell [19]. In sensitive individuals, gastrointestinal irritation may also occur. Exposure to low pH values can also result in similar effects. Below pH 4, redness and irritation of the eyes have been reported, the severity of which increases with decreasing pH. Below pH 2.5, damage to the epithelium is irreversible and extensive [19]. In addition, because pH can affect the degree of corrosion of metals as well as disinfection efficiency, it may have an indirect effect on health.

Although pH usually has no direct impact on water consumers, it is one of the most important operational water-quality parameters. Careful attention to pH control is necessary at all stages of water treatment to ensure satisfactory water clarification and disinfection. For effective disinfection with chlorine, the pH should preferably be less than 8. The pH of the water entering the distribution system must be controlled to minimize the corrosion of water mains 2 and pipes in household water systems. Failure to do so can result in the contamination of drinking-water and in adverse effects on its taste, odour, and appearance. The optimum pH will vary in different supplies according to the composition of the water and the nature of the construction materials used in the distribution system, but is often in the range 6.5–9.5. Extreme pH values can result from accidental spills, treatment breakdowns, and insufficiently cured cement mortar pipe linings. No health-based guideline value is proposed for pH.

Drinking water PH plays a vital role on human's health. People drinking RO water is acidic so it alters the PH of the blood. Normally PH of the blood is 7.4 its value neither decreases nor increases. When people are drinking low PH water the blood PH alters to lower end value, so the PH of the blood to be raised to normal value. For this the blood PH the blood takes calcium cations from bones. In our human body bones are good sources for calcium. When our blood has excess of calcium, the excess calcium can be stored in bones as calcium phosphate by using silicon.

When we drink moderate low PH water our blood takes calcium from the bones. It is revealed that leads to joint pains in knee, it further leads to osteoporosis

In our survey all most all mineral water plants that are purified by the RO process are producing moderate low PH water. Due to this reason number of osteoporosis cases is reporting much day by day. In order to overcome this issue the PH of the water should be raised to normal PH range i.e. 7 to 8.5.

1 out of 8 males and 1 out of 3 females in India suffer from osteoporosis, making India one of the largest affected countries in the world. Osteoporosis cases were reported nearly 26 millions in 2003, but during the last 10 years period additional 10 millions osteoporosis cases were reported. In western countries major osteoporosis cases were observed in the age group of about 70-80 years of age. But in India many of osteoporosis cases were observed at the age of 50-60.

In the Telangana and Andhra Pradesh ground water is not suitable to drink due to high TDS value. High TDS means there is possibility of presecence of toxic metal ions like lead Arsenic. Presecence of Arsenic metal water leads to cancer in the humans

High TDS value is successfully reduced to low TDS value by using RO water Plants, but the PH value is not being maintained resulting in the desired range, the RO water acidic in nature this acidic RO water is not good for health. In order to maintain the normal PH range some alkali minerals to be added. Sodium bicarbonate, potassium bicarbonate calcium hydroxide to be added to raise the PH of the RO water. During the purification system of the RO water 99% calcium is removed from the ground water. So to maintain the calcium levels i.e. 1500mg per day the calcium hydroxide is added to RO water

IMPORTANCE OF OXIDATION-REDUCTION POTENTIAL (ORP)

HIGH POSITIVE ORP = DISINFECTING POWER

A high positive **ORP** is desired in sewage treatment, swimming pools and spas, because the higher the ORP, the more oxidation will occur, thus killing the bacteria and unwanted pathogens, by stealing electrons from the bacteria's DNA, cell membranes and proteins.[20] Chlorine is added to water because it has a high ORP and thus is an effective disinfectant.[21] It is the high ORP of **electrolyzed oxidizing water** that makes it an effective bactericidal.[22] Oxygen also has a high ORP[23] and can damage DNA and proteins.[24] Conversely **molecular hydrogen** exhibits a very low ORP[25] and is thus a reducing agent or antioxidant.[26]

ORP OF DRINKING WATER: EFFECTS ON HEALTH

Like pools and spas, drinking water quality is also determined by national standards. However, ORP is a non-standardized indicator. Chlorine is normally added to drinking water because it has a high positive ORP and will therefore oxidize and destroy the bacteria that are harmful to humans.[2] However, the ORP of the internal environment of a healthy person is always on the reductive side,[27,28] with some redox couples below -350 mV.[29] Therefore, with a healthy viewpoint in mind, it would make sense that the optimal drinking water is one with a negative ORP. Drinking water with a positive ORP is reduced to a reductive ORP at the expense of consuming the electrical energy from cell membranes.[29-30] Normal tap water, bottled water, rain water, and so forth, have a positive ORP generally between 200-400 mV,[27] and even as high as 500-600 mV depending on location.[31] Indeed, tap water has been shown to be a weak pro-oxidant.[32] It was demonstrated in one study that where mineral water shifted intracellular redox state to a 6-10% higher oxidized state, tap water containing HOCl (from addition of chlorine) shifted the intracellular redox state to a 25% higher oxidized state in rat skeletal muscle cells.[33]

ORP OF DRINKING WATER: RECOMMENDATION

A low ORP is also seen with certain human biological fluids.[34-35] 16 The oral fluid of a healthy human and mother's milk both have negative ORP -70 mV,[27] as does freshly made fruit and vegetable juice such as carrot juice with an ORP of -50 mV.[27] Okouchi and colleagues[34] measured the ORP of an assortment of physiological samples of healthy individuals including: skin, blood plasma, amniotic fluid, saliva and urine. They found that all of these had reductive characteristics.

They also measured a variety of fresh foodstuffs and an assortment of fruits and vegetables and noted that they all exhibited reductive characteristics. The researchers also noted that an ORP measurement could suggest the degree of freshness by comparing the value to its known value when fresh.

It was also observed that many commercial beverages and tap water all exhibited oxidative characteristics. In lieu of these observations, the authors proposed a functional type of water having reductive characteristics that can be classified as vital water because it would be analogous to physiological and biological fluids, as well as the many foodstuffs that are required for growth and development. In conclusion, they recommend that water should have reductive characteristics, which is "less stimulating to the human body".

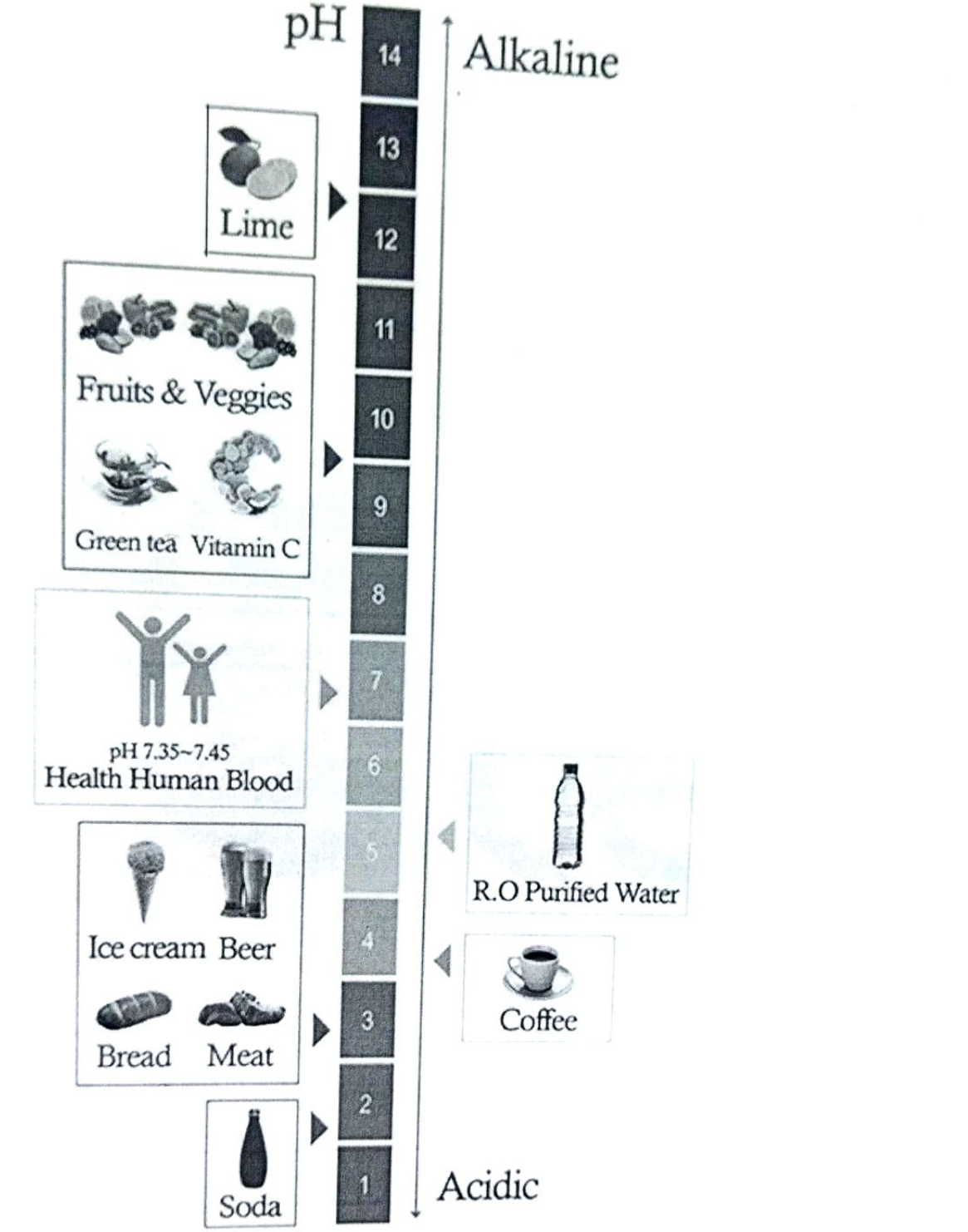
However, as mentioned before, more important than the ORP value is the chemical species responsible for that ORP value. Just because water has a low or negative ORP, does not mean that it has any physiological or biological antioxidant value if consumed internally. Indeed, something with a negative ORP could actually be toxic, and something with a positive ORP may actually be therapeutic.

Finding and Analysis:

The mineral water plants, running in the Telangana and Andhra Pradesh are not maintaining the desired PH Parameter for water i.e. in between 7 to 8.5. No mineral water plant is assisted with chemist. They even don't know about PH and TDS parameters, whereas the branded companies like bisleri and Kinley are maintain the PH of water by adding minerals. Bisleri Company is maintaining the PH of the water by adding potassium bicarbonate and magnesium sulphate and the kinley company is adding sodium bicarbonate and magnesium sulphate.

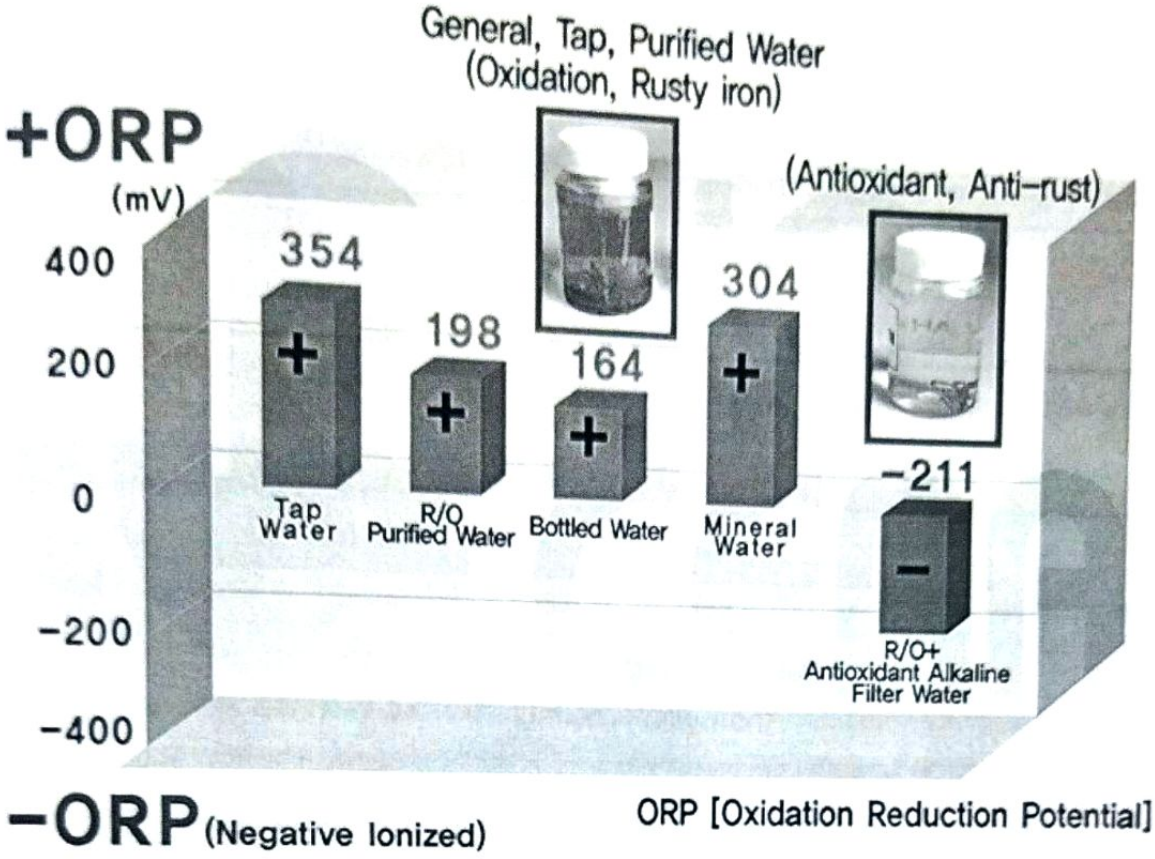
So every mineral water plant has to add alkali minerals to RO purified water in view of protecting the people's health.

Food Acidic & Alkaline Chart



Antioxidant Alkaline Water International

1. Safety NSF certified, ROHAS, Pass FDA, EPA.
2. PH Alkaline
3. TDS Mineral Increase
4. ORP Negative Antioxidant



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