

**COMPARATIVE ANALYSIS OF WATER PURIFICATION
USING STRYCHNOS POTATORUM SEEDS Vs
CONVENTIONAL METHOD (RO)**

Balashnamugam, P., Balaji, R and C.Kiruthuga

Dept. of Biotechnology, Madha Engineering College, Kundrathur, Chennai-69.

ABSTRACT

The study discusses the usefulness of natural adsorbent that is inexpensive to efficiently treat contaminated water gathered from Chennai and the surrounding areas. Strychnos potatorum seeds that grow naturally were compared to reverse osmosis filtered water in terms of how well they cleaned turbid water. The Susruta Samhita has a reference to the use of S. potatorum seed for purifying murky water (Bhishagratna, 1991). The anionic polyelectrolytes, such as -COOH and -OH groups, found in the surface of the seeds are thought to be responsible for their ability to coagulate. RO water purification results in demineralization, or the removal of the vital minerals that are naturally present. According to Packialakshmi et al. (2014), the seeds of Strychnos potatorum have coagulation, metal binding, and antibacterial properties, making them excellent for water. The physiochemical and biological parameters such as PH, TDS, Turbidity, conductivity, no of colonies formed, presence of minerals such as Calcium, Magnesium, Fluorides was analysed before and after treatment with seeds.

KEYWORDS: Adsorbant, Reverse Osmosis, Demineralisation, Anionic Polyelectrolytes,

INTRODUCTION

Some observers have estimated that by 2025 more than half the world population will be facing water based vulnerability. Almost 95% of rural population living in India depend on ground water for domestic use (1). Water plays an important role in the world economy, as it functions as a solvent for a wide variety of substances. In rural areas 80% of the total water is used for drinking purpose and 50% of water is used for agricultural purposes. Approximately one billion people still lack access to safe Water. Chennai is entirely dependent on ground water to meet its

water demand. Chennai receives about 985 million liter per day from Chembarampaakam lake, Poondi Reservoir, Porur Lake, Puzhal Lake, Veeranam Lake, etc,



Figure 1. strychnos potatorum seeds

Reverse osmosis (RO):

Reverse osmosis (RO) is a water purification technology that uses a semipermeable membrane to remove ions, molecules, and larger particles from drinking water. In reverse osmosis, an applied pressure is used to overcome osmotic pressure, a colligative property, that is driven by chemical potential differences of solvent, a thermodynamic parameter. Reverse osmosis can remove many types dissolved and suspended species from water, including bacteria, and is used in other industrial processes and the production of potable water (2). The result is that the solute is retained on the pressurized side of the membrane and the pure solvent is allowed to pass to the other side.

The disadvantages of RO processed water is most mineral particles including sodium, calcium, magnesium, magnesium, and iron) are larger than water molecules, they are removed by the semi-permeable membrane of the R.O. system. Drinking de-mineralized water is not healthy. The World Health Organization conducted a study that revealed some of the health risks associated with drinking Demineralized water (3). Just a few of the risks include gastrointestinal problems, bone density issues, joint conditions, and cardiovascular disease. Removing the naturally occurring minerals also leaves the Water tasteless. Many people thus have to add liquid minerals to their R.O. water to improve the taste.

GEOGRAPHY OF RIVERS

Porur lake:

- Country : India, State : Tamil Nadu, District : Chennai, Area : 3.78 km (sq) Elevation : 16m (52ft)
- Coordinates : 13.034223°N 80.15065°E

Chembarampakkam lake :

- The Full Tank Level is 85.40 ft (26.03 m).
- The Full Capacity (mc.ft) of the lake is 3,645 million ft³ (108million m³).
- The Level of the tank in feet is 75.60 ft (23.04 m).
- Location : Kanchipuram(dt),Tamilnadu,South India, Type: Reservoir,
- Coordinates : 13.01158°N 80.06063°E, Surface area: 3,800 acres (15 km sq)

Puzhal Lake:

- Location: Redhills, Thiruvallur(dt), Tamil Nadu; Coordinates : 13°10'00"N 80°10'17.5"E
- Primary outflow: 9607(cu.secs) highest
- Primary inflow: 5470(cu.secs) highest
- Type: Reservoir; Surface area : 4,500 acres (18km sq); Average depth: 50.20 feet (15.30m); Water volume : 3,300 million ft

MATERIALS AND METHODS

Glasswares such as beakers, test tubes, pipettes, Glass L rod, Petri plate and other glasswares used for experiments were immersed in cleaning solution for an hour and washed thoroughly with tap water Then they were washed with diluted commercial detergent, rinsed with tap water and finally rinsed in distilled water. Then the dried glassware and media were sterilized in an autoclave under 15 lbs pressure at 121°C for 15 minutes.

The water samples were analysed for pH, Turbidity, Total Dissolved Solids(TDS). Electrical Conductivity, Biological Testing, Chemical analysis(Calcium, Magnesium. Fluorides). The seed was weighed 100 gm and soaked in water for 3 to 4 days. It was finely grinded into thick paste and stored in Refrigerator (Deshmukh et al). The water samples were collected from three lakes namely Chembarampakkam, Porur and Puzhal. The physical parameters such as pH, Total Dissolved Solids, Turbidity, Electrical Conductivity were analysed in the laboratory in sterile condition.

Biological test for presence of Coliform bacteria was observed by spread plate method using Luria Bertani agar medium. (About 0.1 ml of the undiluted water sample was spread over the solidified agar in Petri plate After 24 hours incubation the number of colonies was counted using colony counter. The naturally present minerals such as Calcium, Magnesium and Fluorides was also determined in the untreated water. The seed paste was added to the lake water samples taken in conical flask in the concentration of 1 g/L. It was kept in orbital shaker for 24 hours at 120 rpm.

After treatment, the flasks was left for sedimentation for some time. The samples was filtered using Whatmann Filter Paper (4). The filtered sample Was then analysed for the Physical Parameters after treatment. The sample was spread plated after treatment and the Colonies was counted. The presence of minerals such as Calcium, Magnesium, Fluorides was detected in the treated sample. Waste water collected from Lakes, Sodium Tetra Borate Buffer (pH = 9.2), Digital pH meter Tissue paper, Distilled water

RESULTS AND DISCUSSION

pH value is an important factor in indicating the carbonate and bicarbonate levels nwater. The normal range for drinking water should be between 6.8 to 7.2. The H testing was done for the Porur, Puzhal and Chembarampaakam lake water amples and from the results it is noted that Chembarampaakam shows highest pH values.

Turbidity is the cloudiness or haziness of a fluid caused by large numbers of Individual particles that are generally invisible to the naked eye, similar to smoke En air. The measurement of turbidity is a key test of water quality.

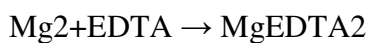
Total dissolved solids are normally discussed only for freshwater systems, as salinity includes some of the ions constituting the definition of TDS. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (5).

The electrical conductivity of the water depends on the water temperature: the higher the temperature, the higher the electrical conductivity would be. The electrical conductivity of water increases by 2-3% for an increase of 1 degree Celsius of water temperature. Many EC meters nowadays automatically standardize the readings to 25°C.

Coliform bacteria are relatively simple to identify and are present in much larger numbers than more dangerous pathogens. By monitoring coliform bacteria, the increase or decrease of many pathogenic bacteria can be estimated.

The calcium hardness in water is determined by following ISO 3025 part no- 40. Calcium is usually found in highest concentrations in natural water. The presence of calcium in water results from deposits of lime stone, gypsum etc.

Magnesium can be easily determined by EDTA titration in the pH 10 against Eriochrome Black T. Reaction taking place during titration is



CONCLUSION

After treatment, the water was analysed for various physical, chemical and biological parameters. Reduction of microbial colonies, pH, turbidity, TDS was observed in treated water. Whereas the essential minerals naturally present in water sustained. The Water samples which has higher pH such as Chembaramy.cam and Puzhal shows decrease in Calcium and Magnesium levels after treatment. whereas porur water with pH 6.4 shows increase in Calcium and Magnesium. The Fluoride concentration of the water samples were decreased independent of the pit.

The results of the study prove that the seeds possess natural, absorbent and coagulant activity. Hence it is effective for drinking water treatment. It is an effective method than any other process. The metal binding property of the seeds is of interest in the field of science. *Strychnos pottorum* also exhibit a good inhibition activity on the growth of coliform bacteria that adds to their safe use. The seeds are a rich source of polysaccharide gum suitable for use in paper and

textile industries. Water purification using seeds removes dirt, impurities, colloidal substances, bacteria to an extent, but sustains the naturally occurring minerals in water, which is not possible in RO water. It has been demonstrated that consuming water of low mineral content has a negative effect on homeostasis mechanism compromising the mineral and water metabolism in the body. It also leads to dilution of electrolytes dissolved in the body water. The main disadvantage of this seed purification process is that it takes 24 hours for treatment.

REFERENCES

1. Koehn J. D., 2004 Carp (*Cyprinus carpio*) as a powerful invader of Australian waterways. *Freshwater Biology* 49:882-894.
2. Indira, N., Arunthathi, R., Valivittan, K and P.Dhasarathan. 2018. Physico- chemical analysis of natural water sources at Thengaipattinam, Kanyakumari district, Tamilnadu, India. *Eco. Env, & Cons.*24: (4): 1859-1865.
3. Seegers L, De Vos L, Okayo DO. Annotated checklist of the freshwater fishes of Kenya from Lake Victoria. *J.E Afr. Nat. Hist.* 2003; 92:11-47.
4. Parameswaran, S., Radhakrishnan, S., Selvaraj, C., Bhuyan, B. R. (1971): Fish yield from Assam ponds kept under different experimental conditions. *Indian Journal of Fisheries*, 18, 1-2, 67-83.
5. Marr, S. M., Olden, J. D., Leprieur, F., Arismendi, I., Čaleta, M., Morgan, D. L., Nocita, A., Šanda, R., Tarkan, A. S., Garcia-Berthou, E. (2013): A global assessment of freshwater fish introductions in mediterranean-climate regions. *Hydrobiologia*, 719, 1, 317-329.